RAILROAD GAZETTE

FRIDAY, NOV. 22.

CONTENTS.

ILLUSTRATIONS:	PAGE.
The Standard Compound Express Locomotive of the Saxon State Railroads	762
Some Effects of a Blast	765
Automatic Cut-off Machine	766
Punching and Shearing Machine	766
The Wells Light	768
CONTRIBUTIONS:	
The Railroad Men's Building	761
The Use of 60-ft. Rails on the London & Northwestern	761
Compression in Locomotive Cylinders	761
Injuries to Track from Hollow Treads	761
The Link Coupler	761
Electric Lighting of Trains	761
EDITORIALS:	
Steam Action in Locomotive Cylinders at High Speeds	770
The Question Box	771
Steel in Locomotive Boilers	771
EDITORIAL NOTES	770, 772
NEW PUBLICATIONS	773
TRADE CATALOGUES	773
GENERAL RAILROAD NEWS:	
Meetings and Announcements	777
Personal	777
Elections and Appointments	777
Old and New Roads	778
Traffic	780
MISCELLANEOUS:	
Technical	774
The Scrap Heap	776
Journals and Journal Bearings—New England Railroad Club	765
Compound Locomotives in India	766
Metal for Brake Shoes	767
The American Society of Mechanical Engineers—Twentieth Meeting	768

Contributions.

The Railroad Men's Building.

TO THE EDITOR OF THE RAILROAD GAZETTE.

My attention has been called to a letter which appeared in a recent issue of your paper, from a manufacturer, asking what plans for the improvement of the condition of employés had been put in operation by railroad companies and others.

The Railroad Men's Building, New York, was erected by Mr. Cornelius Vanderbilt, for "the use of the men employed by the companies whose lines enter the Grand Central Depot," in 1887. It has been very successful. The average daily attendance is nearly 400. There are now 1,115 members. The building is fitted up in the best style, and is kept up by the railroad companies and the personal contributions of the donor.

It is in charge of the Railroad Branch of the Young Men's Christian Association, whose officers arrange and manage the entertainments, lectures, evening classes and religious meetings. The religious sentiment which pervades all that is done serves as a conservative force, so that the moral atmosphere of the place is very high. A unique plan of membership has been devised, a man being allowed to pay quarterly, semi-annually or annually, any sum he can spare from $1.20 per year upward.

These small voluntary contributions toward the current expenses of the institution serve to develop in the men a sense of proprietorship, and provide against the feeling so detestable to every true man—that of dependence upon the charity of others. G. A. WARBURTON.

The Use of 60-Ft. Rails on the London & Northwestern.

LONDON, Nov. 6, 1889.

TO THE EDITOR OF THE RAILROAD GAZETTE:

We use 60-ft. rails over girder bridges of between 30 and 60-ft. span, and the immediate object is to avoid joints coming upon or between the cross girders.

The abstract advantages and disadvantages of long rails may, I think, be summed up briefly as follows:

Fewer joints means smoother running, less labor in jacking sleepers (which always requires more attention at the joints than elsewhere), fewer fish plates and bolts to provide and maintain, fewer crop ends and consequent waste in a given length of permanent way, and a more uniform curvature, especially on curves of small radius. On the other hand, such long rails are more difficult to handle and more likely to be injured, and it is not so easy to provide for the expansion and contraction consequent on changes of temperature as can be done with shorter rails by leaving space between the ends.

On the whole, however, for special purposes, as I have said, the advantages are held to outweigh the disadvantages. G. FINDLAY, General Manager.

[In Mr. Findlay's admirable little book, "The Working and Management of a Great Railway," we are told that the London & Northwestern has in track 10 miles of 60-ft. rails. The letter given above is in answer to an inquiry as to the reasons for using rails so long and as to theresults of experience with them. We have recently spoken of the experiment of the Pennsylvania Railroad with four miles of 60-ft. rails.—EDITOR RAILROAD GAZETTE.]

Compression in Locomotive Cylinders.

TO THE EDITOR OF THE RAILROAD GAZETTE.

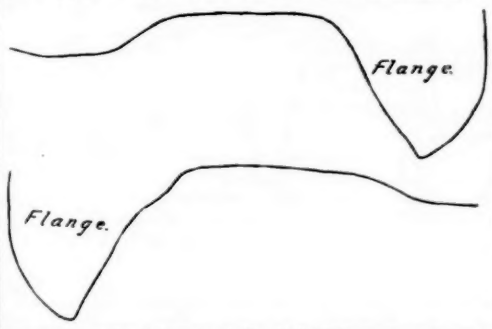
I have noticed in the *American Machinist* a criticism on a recent editorial in the *Railroad Gazette* regarding compression in locomotive cylinders, and I send you the following facts, which may throw some light upon the statements made in your columns, which I believe to be correct. Not long since I was riding on a dynamometer car back of a large express locomotive drawing a heavy train at 50 miles per hour. The locomotive was doing all it possibly could to accelerate the speed of the train, and yet there was a large amount of steam blowing off at the safety valve. The cut-off was at about 6 in., and no manipulation of the reverse or throttle levers would increase the speed. If the cut-off was increased the speed fell. If it was decreased, the speed fell also. Why was this? The indicator diagrams taken at the time showed just why. When the cut-off was increased the back pressure rose accordingly, and the compression therefore became enormous and reached the initial pressure before the end of the stroke was reached, thus cutting down the card to an area less than before. If the cut off was decreased then the power was less, because less steam was admitted. Then and there the question arose how to get greater power from that locomotive. It was evident that the maximum mean effective pressure obtainable with that valve gear and steam pressure, and at that speed, was obtained on the first card. Now, if this does not indicate that either larger cylinders must be used, or the valve gear changed, to get a greater area of indicator card at high speeds, then what does it indicate? Perhaps the *American Machinist* can show how to get greater power with a given mean effective pressure at a given speed without using larger cylinders. Z.

Injuries to Track from Hollow Treads.

Vermont Valley Railroad Co. of 1871,
CHARLESTOWN, N. H., Nov. 3, 1889.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your report of the discussion of the New England Railroad Club, in your issue of Oct. 18, you make me say, "What is wanted is to adze down the tie in the main track. The rail has been crowded into the tie so as to allow the driver to strike it." This appear on page 676. The language was not used by me, as I use plates to keep the bases of the rails on the same plane on all the ties under the split switch from which the section of rail referred to was taken. I am now using plates in this manner under all point or split switches.



I inclose tracings of tread of drivers taken from an engine doing service on a road not 200 miles from your office. Wheels of this kind are what cause more trouble at frogs and switches than anything else I know of. In fact, they cause the trackmen more trouble, and cost the company more money than any other one thing.

WM. E. CLARK.

[The passage referred to occurred in the report of Mr. Clark's discussion of Mr. Ellis' paper. The paragraph in full follows. It is as we received it in the stenographic report:

"I have brought with me a piece of rail (showing a piece of rail very badly damaged) that was in the track this morning 10 ft. from the point of the switch. I claim that the tire that will wear a rail into that condition is not a safe tire to run over a split switch. That rail has been in the track 18 months. I believe that the split switch at the point should not get so much damaged as to have to be taken out under less than three years, or that anything like that should occur within that time. What is wanted is to adze down the tie in the main track; the rail has been crowded into the tie so as to allow the driver to strike it. I don't think anything does so much damage to a split switch as a hollow double-flange wheel. I don't think this piece of rail is an exceptional case; you can find such on roads anywhere that use split switches, though I think that is the switch for us to use."—EDITOR RAILROAD GAZETTE.]

The Link Coupler.

PITTSBURGH, Pa., Nov. 12, 1889.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In a recent number of the *Railway Master Mechanic*, the editor exhibits unmistakable symptoms of an aggravated attack of vertical hook coupler on the brain. His disparaging remarks concerning past inventors, as well as any future ones who may attempt to invent an automatic link coupler, are terrible. He virtually states that perfection has been reached, and further progress in the way of automatic link couplers is useless; that any and every device past, present and to come has concentrated and culminated in the vertical hook. Now, I will venture the assertion that that editor never coupled a car in his life except in his imagination and while sitting at his office desk; and, let me add right here, that coupling cars in a cozy office and coupling on a railroad, especially on a cold night, perhaps in a blinding storm of rain or snow, are two separate and distinct modes of doing the thing.

The subscriber is interested in an automatic link coupler, and eminent practical railroad men say it is good a very good one, but, although interested in this coupler, I do not say the vertical hook coupler is not good. I know it is. But I do say, however, what dozens of these same practical railroad men have said to me, "The vertical hook coupler is not near perfection, and is giving us a great deal of trouble." I am speaking of its application to freight cars exclusively. Now I know, and this editor may know if he will only talk to practical railroad men, the men who handle the trains, that none of these vertical hook couplers are giving *perfect* satisfaction, and you might just as well try to convince a railroad man that two trains can pass on the same track, as to try to persuade him to the contrary.

I will venture to predict that "automatic link couplers" will be used on American and other railroads long after the remains of this editor are in a worse state of preservation than the "mumified Egyptian," to which he so playfully alludes in his article. Furthermore, I can produce a letter written by this same editor or manager, dated July 30, 1888, in which he highly commends at least one automatic link coupler, and expresses doubt as to "whether the standard will stand" (referring to the vertical hook). This same opinion regarding the hook is entertained by many railroad officials. Stick to this opinion, Mr. Editor; it is just as true to-day as it was a little over a year ago. LINK.

[We quite agree with Mr. Link that the M. C. B. coupler is not perfect. A well-known professor of physics used to begin one of his lectures with these words, "Now remember, young gentlemen, that there is nothing absolute but God." So perfection is not to be attained in the work of human hands. We have no doubt, however, that the M. C. B. coupler embodies the correct principles, that it is now an economical, durable and efficient device, and that the standard will stand. We think that the editor whom Mr. Link speaks of also believes so now. A few months before the last Master Car Builders' Convention a movement was started to either upset the standard or to have a double standard, vertical plane couplers for those who want them and link couplers for others, but the project did not appear above the surface at the convention, and seems to have died of a want of appreciation. Nevertheless there are about 1,000,000 cars in freight service in the United States, and it is probably considerably within bounds to say that 950,000 of these still have the link and pin coupler in some form. So there is a big market open yet for all hands, and the man who has a first-rate automatic coupler of any kind need not despair.—EDITOR RAILROAD GAZETTE.]

Electric Lighting of Trains.

Baltimore & Ohio Railroad Company,
General Superintendent's Office,
BALTIMORE, Nov. 15, 1889.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I note in your issue of Oct. 24 two paragraphs which do not fairly represent my position on the subject of electric lighting of trains. I do not mean by this that you have unfairly handled the subject, but that my position in the matter was misunderstood.

In the first paragraph you take issue with me upon the use of a light, other than electric, in the cars, and speak of the uncleanliness of lamps and say "their presence with the electric lamps would at once suggest the unreliability of electricity." Auxiliary lighting apparatus, either gas, oil or some other kind, is maintained in almost every apartment in which electric lights are used, and I think this is a wise precaution, for whether it be in city, overhead or underground, the fear of loss of supply (not borne out by facts, possibly) has been such that parties using the electric light and builders equipping buildings for its use have fortified themselves against possible failure by the use of auxiliaries heretofore employed. Therefore, you will find, with the most workmanlike plant in existence to-day, this fortification, whether the plant be upon wheels or not.

I think you should not lose sight of the fact that in the electric lighting of a car there is but one source from which to produce light. That source may be a dynamo or it may be a storage battery, or it may be both, but when both are used they are simply a combined force, the battery being, as it were, an adjunct to that force. From this one source all lights within the car are fed. Therefore, the breakage, dismemberment or failure of any part of that source affects *all* of the lights dependent upon it. The result is a total loss of illumination under many circumstances. That these circumstances are probable no railroad or electrical man, especially, will deny. Wires may be easily fractured under cover, connections which are apparently all right may fail in their effect, and in case of derailment or collision there is a great liability of breakage of *some* part upon which *all* of the lamps depend; this cannot be gainsaid.

Where, however, you have lamps, or candles if you choose, distributed through the car, each point of illumination *has its own and separate source of supply*, so that

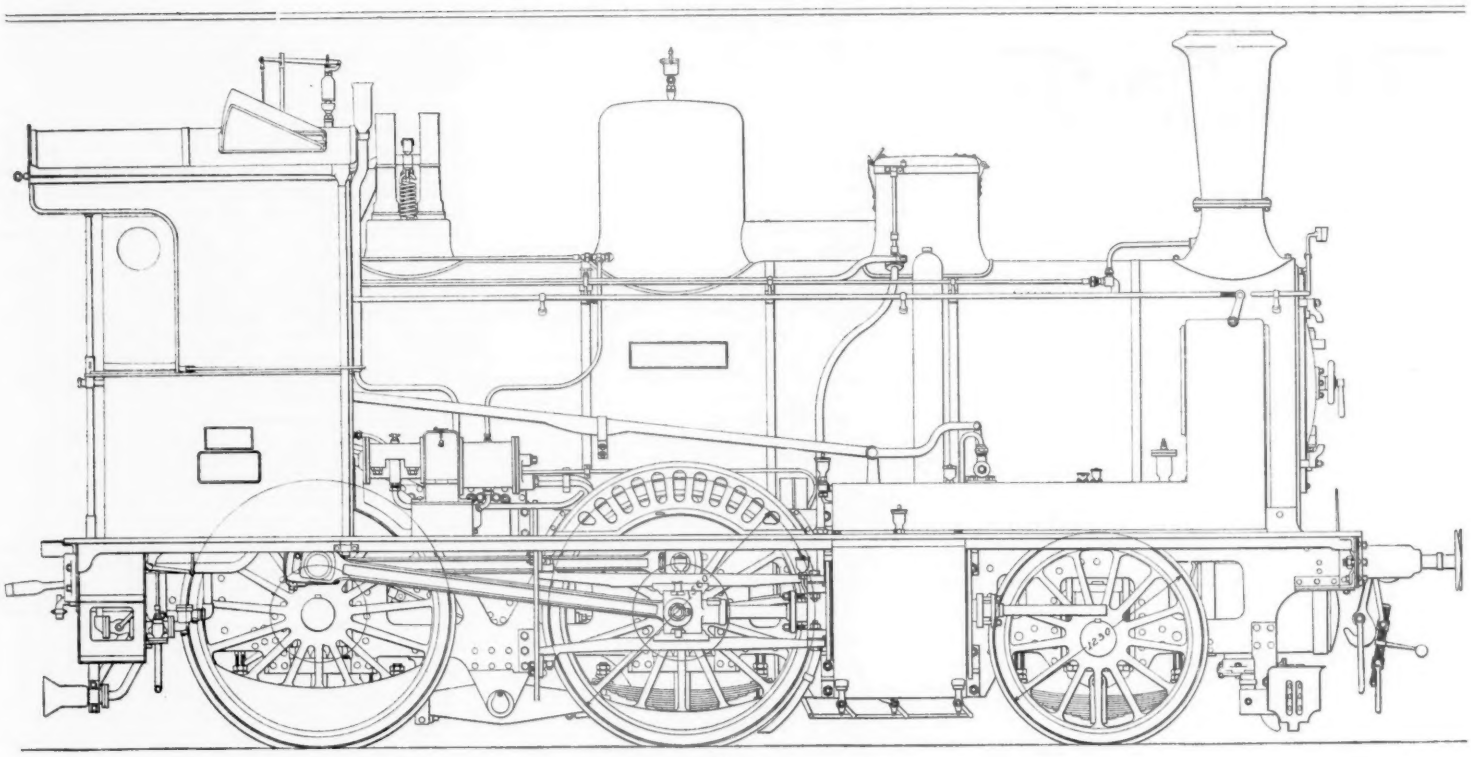


Fig. 3

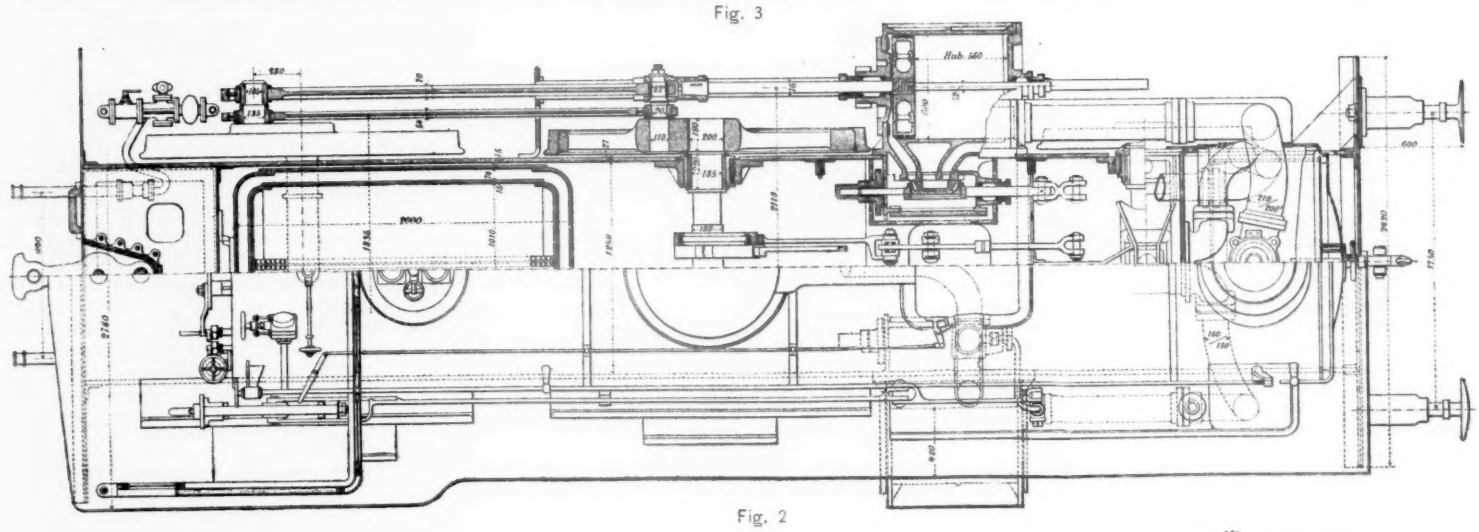


Fig. 2

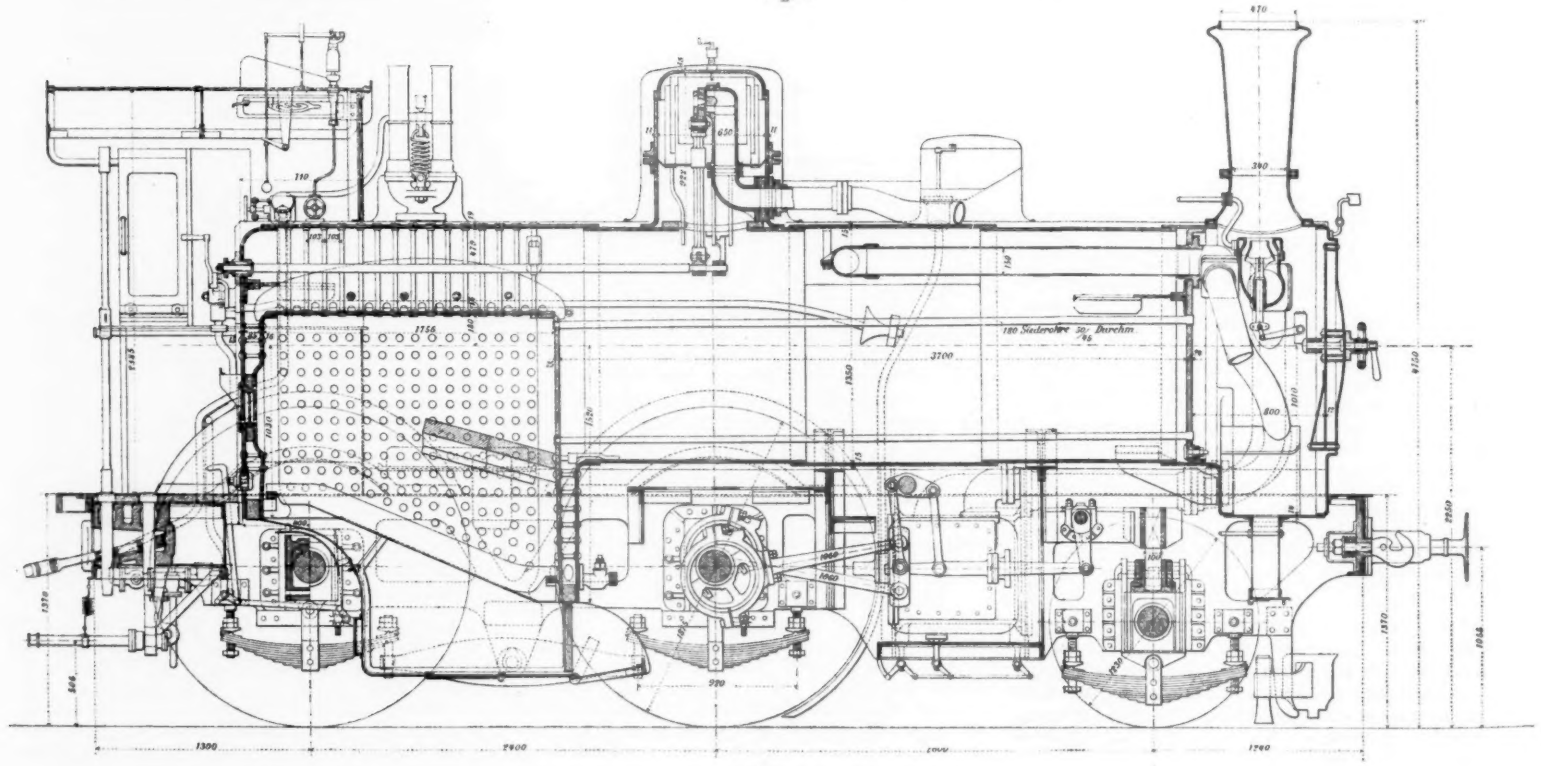


Fig. 1.

THE STANDARD COMPOUND EXPRESS LOCOMOTIVE OF THE SAXON STATE RAILROADS.

if a number of these sources are destroyed there is still a chance that some one of them may escape destruction and through its source furnish sufficient light to enable one, at least, to make some progress under fewer difficulties than though the car was in absolute darkness.

In my investigation, covering as it did a number of railroads using the electric light system, I found *not one* that had discarded the auxiliary systems of illumination on account of having the electric method.

In my opinion, there is no light so beautiful, so cleanly, so enjoyable or so safe as that afforded by the incandescent systems upon moving trains; therefore I would be the last one in the world to knowingly influence any one against its adoption; at the same time the experience of others, as well as my own, from a railroad standpoint, compels me to state what I believe to be true in such connection.

I agree with you that by far the best results are ob-

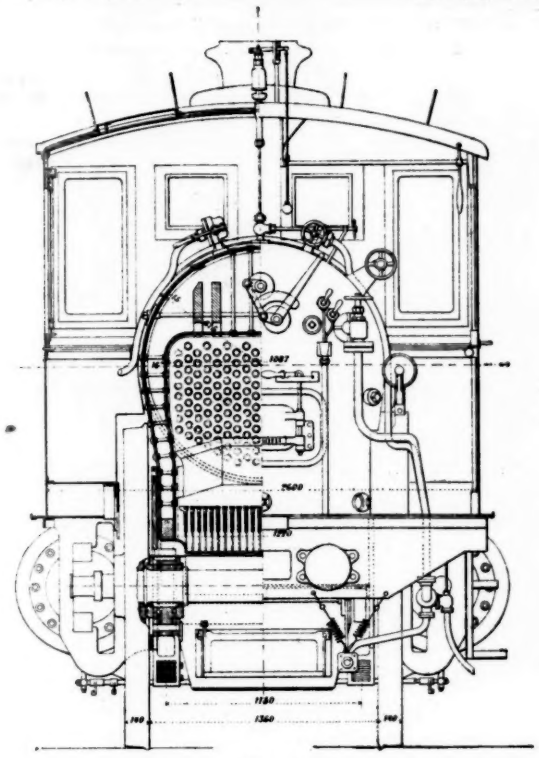


Fig. 4.

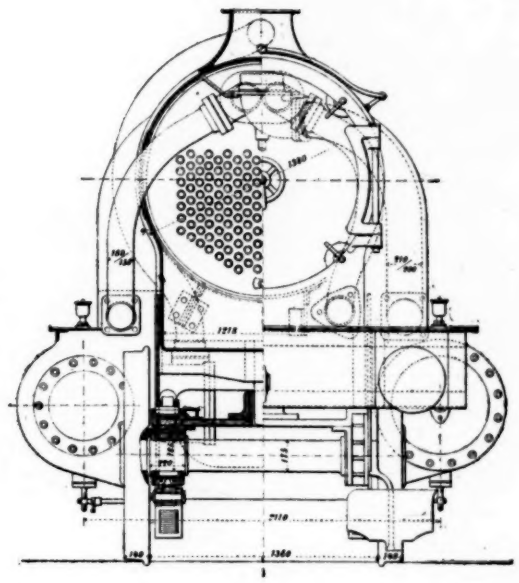


Fig. 5.

THE STANDARD COMPOUND EXPRESS LOCOMOTIVE OF THE SAXON STATE RAILROADS.

tainable when a first-class plant in every particular is used, independent of its cost. I believe that such a plant can be relied upon 95 per cent. of the time (possibly even a larger percentage than this), but there are times when failures are not only possible but quite probable, and at such times it is a very desirable thing to have more than one source upon which we are dependent for illumination. The large percentage of times upon which you may depend upon the successful employment of electricity is, in my opinion, so great that railroads using this method could, without danger, discontinue lamps, but I should certainly advise that some other source of light be kept on hand to cover even the small percentage of contingency.

There are a great many railroads in the United States that can afford to equip their trains with a first-class system; there are others, however, which cannot; and aside from the ability so to do, you doubtless would recognize that all companies look at a great many matters of this character from a position of cost. If now, through some suggestion, the cost is lessened, so that, for example, that with a first-class system in every respect the total cost per day per car would be $1.72, or under another system—not so good a one, because not so complete—the cost could be reduced to $1 per car per day, and the service performed by this cheaper method be *far in advance of the ordinary one employed, and still not exceed it in expense greatly*, the chances are that many railroads might be induced to take hold of the matter at such a cost which would not have been able to do so at the cost first named. This being true, and having gone thus far in the matter, the desirability of the method having shown itself, there is a possibility that they might, later on, even at an extreme cost, decide to go further in the matter and thereby obtain an absolutely first-class system. Even in this day, in large cities, you will find people who employ kerosene oil instead of gas, yet these same people have discarded tallow candles. No one denies that gas is superior to either; in the matter of convenience and safety it is far ahead; but the slight increase of oil over the candle comes within the power of the party using it, while the cost of gas does not. This same holds true of persons who use gas today instead of electric illumination, therefore my theory was to present the Association of Railroad Telegraph Superintendents such thoughts as might occur to me in the hope that from that body or from their contact with other people a method might be evolved that would perform the service so well as to induce users to try and strain a point and, in time, put in operation a system that was complete in every respect. I fully appreciate all that you have said in regard to the attraction to passengers, etc., in the use of electric systems, but I do not lose sight of the situation as to the abilities of the railroads in some instances to meet such wants, and it is my endeavor, if possible, to get, through any source, some kind of a system which is, at least, better and safer in every respect than the old methods employed.

I note also that your second paragraph handles a remark of mine in a way that would leave a wrong impression. There was no intention on my part of recommending to the Association any system which was so inflexible as to not admit of the occupants of the car being furnished with all the light necessary, and conveniently arranged for the comfort of each, without disturbing that of their fellow-passengers. I believe in passengers whiling away the time by any reasonable method of amusement. My brother don't even object to poker "generically" or "specifically," provided the "ante" is not too high, and the "limit" is somewhat circumscribed. I think a great deal of my brother, but I do not believe, nor do I think that you would agree, that it is proper for an occupant, or a number of occupants of a car, to so demean themselves as to disturb others after a reasonable hour for retiring has arrived, whether that disturbance arises from one cause or another, and it was in this connection my answer to an inquiry (which I deemed Pickwickian) was drawn out. Of course such actions are independent of any system of lighting.

I should not have written this letter, but when an authority as high as yours misunderstands the position I have taken, I think that justice to you, as well as myself, demands that I should try to set you right. I should have done this sooner; but if you have ever been a candidate for public office in a city election, and passed through the trials of such a campaign, ending with success, in a hotly contested territory, you will doubtless agree with me that you had business enough on hand to let other matters lie over for at least a while.

C. SELDEN.

Comparative Fuel Consumption and Designs of Compound Locomotives Royal Saxon State Railroads.

Compound locomotives are at the present time attracting much attention on account of the economy shown by careful statistics of the operation of such engines in European service. There are several reasons for the decrease in fuel consumption with the compound system engines. Each, however, is the result of compounding directly or indirectly, and it has not yet been determined which of the reasons or causes it is which gives the greatest increase in efficiency. Therefore, in view of this, and by reason of the construction now in this United States of eight different compound locomotives, which are either well underway or are being commenced, we are led to believe that the statistics and illustrations herewith of the operation and design of the various compounds on the Royal Saxon State Railroads in Germany will prove of interest to the railroad fraternity.

It will not be necessary to dwell upon the general construction of the engine, so clearly is it shown by the illustrations; but it may be well to point to some of the interesting features, such as the use of a brick arch in the fire box, a peculiar grate bar, suitable for finely divided or coarse coal, and others. The method of supporting the crown is novel, having a crown bar at the sides longitudinally with the box and radial stays in the centre; the fire box is made of copper, and the boiler shell of steel; in the dome is placed a steam separator, consisting of a series of cylinders arranged so as to form a tortuous passage for the steam from the boiler shell to the throttle. It is intended, with this last device, to remove as much as possible of the water which is often carried over with the steam into the cylinders. Also may be mentioned the steam pipe to the cylinders, which can hardly be termed a dry pipe, as it passes outside of the boiler from the side of the dome, forward as far as the cylinders, and directly around the boiler, as shown in figs. 1 to 3 and 5. There it enters the steam chest of the high-pressure cylinder. In the smoke box is a variable exhaust of unique design, forming with the smoke stack a very satisfactory exhausting apparatus on the ejector principle. The method of admitting steam into the stack to blow the fires is clearly seen in the illustration at the base of the stack, where a small pipe enters an annular ring around the exterior of the exhaust nozzle.

The peculiar joint in the dome, about midway of its vertical height, is for the purpose of permitting an inspection of the water-separating apparatus and throttle

The location of the starting valve which admits steam to the low-pressure cylinder is shown just in front of the high-pressure cylinder. It is operated by an extension of the reach rod, as clearly seen from the illustration. The exhaust pipe from the high-pressure cylinder, which forms the receiver, passes, as it will be noticed, from the high-pressure cylinder forward through the smoke box, and returning on the other side to the low-pressure cylinder. In this design the cylinders are located considerably in the rear of the smoke box. The steam chest valve for the low-pressure cylinder has the Allen or Trick port to assist admission of steam to that cylinder. This is clearly seen from the plan of the engine. The piston rod for the low-pressure cylinder is extended through the front cylinder head and works within a case attached to the stuffing box, as shown in the plan. This covering for the piston rod is not uncommon on the Continent. Several of the locomotives at the Exposition were so constructed. The location of the air pump is horizontal and just in front of the cab. The brakes are constructed on the Carpenter system, which is used on all the state roads in Germany. The general features of construction are most clearly seen from the outline drawing showing the exterior of the locomotive. The link motion shown on this engine is known as the Allen link motion. It differs from the ordinary motion principally in having a straight link, not curved. The links are located on the inside of the engine and are driven from the forward axle, which is not the axle to which the main connecting rod is connected. The location is shown on the plan, and the design of reversing gear can be seen on the side elevation. It will be noticed that the link is connected to one arm of the reversing shaft, and the connecting rod from the link to the rocker is raised and lowered by another arm of the reversing shaft. Therefore, when the engine is reversed, both the link and also the connecting rod to the rocker are raised or lowered, as the case may be.

The following letter from the officers of the Royal Saxon State Railroads to the *Railroad Gazette* gives directly and officially some interesting information with regard to the locomotives of the type shown by the illustrations:

"Before the economy expected from compound locomotives could be secured, it was necessary that the locomotives be so designed as to start into motion, softly and without jerks, heavy or light trains in every position of the cranks. Mallett's first efforts in this direction did not lead to an effective result, and the Webb three-cylinder locomotive does not start trains with that softness and uniformity of acceleration which could be desired. Neither has it been found by actual trial on the Saxon State Roads that other compound locomotives offered for use have produced the satisfactory results required. It is only until recently that universal attention has been attracted to this subject. Among the first in Germany to take the matter in hand

TABLE I.—TABLE OF DIMENSIONS AND PROPORTIONS OF THE COMPOUND AND ORDINARY LOCOMOTIVES TESTED ON THE ROYAL SAXON STATE RAILROADS.

Number for reference.	Type of locomotive.	Road number of locomotive.	Number of locomotives tested.	Duration of service.	Steam pressure above atmospheric pressure, pounds per square inch.	Grate surface, square feet.	Fire-box heating surface, square feet.	Tube heating surface, square feet.	Total heating surface, square feet.	Height of boiler centre above top of rail, inches.	Number of truck axles.	Number of driving axles.	Total number of axles.	Spread of drivers, inches.	Total wheel base, inches.	Diameter of driving wheels, inches.	Diameter of truck wheels, inches.	Unloaded weight, total pounds.	Weight in working order, pounds. Front axle.	Middle axle.	Back axle.	Total.	Diameter of high-pressure cylinder, inches.	Diameter of low-pressure cylinder, inches.	Ratio of cylinder areas.	Stroke of pistons, inches.	Ratio of receiver capacity to high-pressure cylinder capacity.	Number of tubes.	Length of tubes, feet.	Diameter of tubes, inches.	Type of valve gear.	Position of reverse shaft lever arm.
COMPOUND LOCOMOTIVES.																															
1	Freight,	736	1	Jan., 1886	176.4	15.17	88.34	1149.71	1238.05	75.8	.....	3	3	59.1	134.0	55.6	....	80262	32082	29106	29106	90294	18.12	25.6	1:2	24.0	1:1.94	173	14.4	1.8	Allan inside	45½°
2	Express,	734	1	Jan., 1887	176.4	19.58	85.97	1012.95	1098 92	88.7	1 Radial	2	3	94.6	197.0	75.0	49.2	86215	30870	31972	31972	94815	16.55	23.6	1:2,04	22.1	1:2.37	180	12.2	1.8	"	0 °
3	Express,	735	1	Jan., 1888	176.4	19.58	85.97	1012.95	1098.92	88.7	1 Radial	2	3	94.6	197.0	75.0	49.2	86215	30870	31972	31972	94815	16.55	25.6	1:2,4	22.1	1:2.37	180	12.2	1.8	"	0 °
4	Freight,	39,51,236, 242, 337, 754-758	10	July to Sept., '87	176.4	15.17	88.34	1149.71	1238.05	75.8	.....	3	3	59 1	134.0	55.6	...	81585	31862	29877	29877	91617	18.12	25.6	1:2	24.0	1:1 94	173	14.4	1.8	"	45½°
5	Freight,	784-787	4	Nov., 1888	176.4	15.17	88.34	1149.71	1238.05	75.8	.....	3	3	59.1	134.0	55.6	....	.....	.....	...	.....	....	18.12	25.6	1:2	24.0	1:1.94	173	14.4	1 8	"	45½°
6	Express	546 618, 623, 764-766	6	June, 1888	176.4	19.58	85.97	1012.95	1098.92	88.7	1 Radial	2	3	94.6	197.0	75.0	49.2	82687	28003	31641	31641	91287	16.55	23 6	1:2,04	22.1	1:3,28	180	12 2	1.8	"	0 °
7	Suburban,	796-798	3	Feb., 1889	176.4	19.58	85.65	958.29	1043.94	82.7	1 Radial	2	3	83.5	179.3	62.4	49.2	80923	29106	30098	30098	89302	16.55	25.6	1:2,4	22.1	1:2,46	180	11.6	1.8	"	0 °
LOCOMOTIVES ESPECIALLY BUILT FOR COMPARISON—NON-COMPOUND.																															
8	Freight	787	1	Jan., 1886	176.4	15.17	88.34	1149.71	1238.05	75.8	.....	3	3	59.1	134.0	55.6	....	78718	30098	29826	29826	88751	16 75	....	.....	24.0	.....	173	14.4	1.8	Allan inside	.....
9	Express,	735	1	Jan., 1887	154.4	19.58	85.97	1012.95	1098.92	88.7	1 Radial	2	3	94.6	197.0	75.0	49.2	83569	29326	31421	31421	92169	16.55	....	.....	22.1	.....	180	12.2	1.8	"	.....
LOCOMOTIVES TESTED TO ASCERTAIN THE COMPARATIVE ECONOMY OF COMPOUND LOCOMOTIVES.—THESE ENGINES ARE NON-COMPOUND.																															
10	Express	96, 163, 171, 172,	1	1860	125	13.45	84.36	824.86	909.22	77.7	1 Fixed	2	3	99.1	162.7	75.0	41.4	67671	23968	24762	24762	73492	16.0	....	.....	22.1	.....	198	10 2	1.6	Stephenson inside	....
	Express	174	4	1867	125	13.56	83.10	824.86	907.98	77.7	1 Fixed	2	3	99.1	162.7	75.0	41.4	68707	24740	24894	24894	74529	16.0	..	.....	22.1	.....	198	10.2	1.6	Allan inside	
11	Freight,	465, 466 468, 472	4	1875	125	15.17	88.12	1149.71	1237.88	74.7	.....	3	3	60.3	134.0	55.6	....	75852	29547	28113	28113	85774	18.0	....	.....	24.0	.....	195	14.4	1.6	"	.....
12	Freight,	738, 739	2	June, 1885	132.3	15.17	85.97	1149.71	1235.68	74.7	.. ..	3	3	60.3	134.0	55.6	....	77175	30208	28444	28444	87097	18.0	....	.....	24 0	.....	195	14.4	1.6	"	.....
13	Freight,	750, 751	2	March, '87	147	15.17	88.34	1149.71	1238.05	75.8	.....	3	3	59.1	134.0	55.6	....	79880	29995	30298	30208	89412	18.0	..	.....	24.0	.....	173	14.4	1.8	"	.....

Valve Link Rod Guide.—Nos. 1 and 2, unequal lengths; No. 3, equal; Nos. 4, 5 and 6, unequal; No. 7, equal.—*Starting Apparatus.*—No. 1, Von Borries operated by hand; No. 2, Von Borries self-acting; Nos. 3, 4, 5, 6 and 7, Lindner.

was the Royal Prussian State Railroads, and since 1885 the Royal Saxon State Railroads have compounded quite a number of locomotives, and through experience have developed a form of admission valve which permits trains to be started with great evenness. The locomotives of the Saxon State Railroads which are compounded and supplied with the Lindner admission valve, work with satisfaction in starting trains, and show in economy in fuel consumption about 20 per cent. These locomotives draw express trains of ordinary speed on the Dresden & Chemnitz line, which has inclines of one in 40 and one in 60 for 9 miles in length. It draws up these inclines 17 German cars without hesitation, and also will start such trains upon the inclines at any position of the cranks. The principal dimensions of the locomotives are as follows (see Table I.):

Steam pressure	177 lbs. per sq. in.
Grate surface	19.6 sq. ft.
Heating surface in fire box	85.7 sq. ft.
Inside heating surface of tubes	958.3 sq. ft.
Total heating surface	1044. sq. ft.
Actual weight empty	80,924 lbs.
Actual weight ready for service.	89,303 lbs.
Weight available for adhesion	60,196 lbs.
Diameter of the high-pressure cylinder	16½ in.
Diameter of the low-pressure cylinder	25½ in.
Proportion of the cylinder cross sections	1:2.4
Proportion of the contents of the receiver to that of the high-pressure cylinder	2.46:1

"This locomotive has several arrangements peculiar to the Saxon State Railroads, such as the water partition in the dome, which, it will be noticed, tends to sub-divide the steam in a considerable degree before it enters the throttle. It is expected in this way to collect a large percentage, if not all, of the water which would otherwise pass over to the cylinders. The forward axle is carried in movable boxes, by means of which it can assume any necessary position with reference to the rails. The movable boxes are attached to a cross tie, which binds them together, and which in the middle has a trunnion whereon it can turn. At the ends of this centre piece are oblique or incline surfaces on which the spring supports can slide. In action these locomotives are very satisfactory. Steam is freely made, scarcely no sparks are thrown, and no spark catcher is needed when firing, even with brown coal. By a proper arrangement of the receiver with regard to drainage, and by loosely fitted cylinder cocks in the low-pressure cylinder, no water is thrown, when the engine starts, through the smoke-stack. By reversal of the engine and the admission of steam into the opposite sides of the piston when the locomotive is running ahead, and by the opening of a brake cock, which admits a mixture of steam and water into the exhaust pipe of the low-pressure cylinders, the locomotive can be let down the steep inclines at any speed with perfect safety. The safety valve arranged on the receiver leads away the larger part of the hot mixture of air and steam, and only a small portion of it reaches the boiler. The indicator diagrams herewith show the good working of the locomotive when braked, and show how equal is the division of the work of braking in the two cylinders.

"It is naturally to be expected that the experience of the Saxon State Railroads—where the saving by the use of the compound locomotives amounts to $250 per locomotive per year at a coal price of $3 per ton—will attract attention. And because of the novelties in the designs of these locomotives we are led to believe that the illustration thereof and of the starting apparatus, as well as the publication of the tables of fuel consumption, will prove to be of interest to your readers.

" RICHARD KLEIN, Machine Director,
ROBERT LINDNER, Machine Engineer,
Royal Saxon State Railroads."

CHEMNITZ, Saxony, 1889.

The Saxon State Railroads have about eleven freight and seven express locomotives with compound action, and now in process of erection are one express, four freight and three small locomotives. The express locomotives are shown herewith. The cylinders are arranged outside between the front and middle wheels. The back axle is the main driving axle. The receiver is let into the smoke box, and from there into the steam space in the boiler to increase its contents and to act as a superheater. Some of the express locomotives do not possess the connection pipe which runs into the boiler, but only the one which passes through the smoke box. In order to get a sufficiently high fire box, the boiler has been raised in some of the express locomotives. The small, or ordinary locomotives, are built in a similar manner to the express locomotives, but differently from them in wheel position, size of wheel, length and height of boiler, as well as position of boiler and in the dimensions of the low-pressure cylinder. The receiver is, with them, also located only in the smoke box, and does not pass into the boiler steam space. Simultaneously with the building of the first freight compound and express compound were built locomotives not compounded, for the purpose of comparison. They were quite the same in the boiler and other proportions as the compound locomotives with which they were to be compared. The steam pressure at this time was raised from $8\frac{5}{10}$ atmospheres to 12 atmospheres, but gave no increased economy in coal with the ordinary locomotive. In all the compound locomotives the high-pressure cylinder is arranged on the right-hand side, and the low-pressure cylinder on the left. The steam receiver is equipped with a safety valve adjusted to blow off easily at one-half boiler pressure. Some of the locomotives were built with a cylinder ratio of one to two, but in order to make them work satisfactorily it was found necessary to change the angle of the arms on the reverse shaft, or the length of the link lifters, in order to secure a satisfactory use of the steam in the low-pressure cylinder. This led to the difficulty of a very unsatisfactory operation when the locomotive was reversed and running backward; then, as will be easily seen, the cut-off in the high-pressure cylinder was longer than that in the low-pressure cylinder. In the later engines, the proportion between the cylinders has been increased from 1 to 2 to 1 to $2\frac{4}{10}$. In this case the links were made to operate exactly alike, and the maximum cut-off possible in both cylinders is the same, and in running backward the locomotive operates as well as in going forward. The 12 compound locomotives made in the years 1885 to 1887 were first provided with the Von Borries starting valves. In the spring of 1888 that valve was succeeded by the Lindner starting apparatus, and after considerable experiment with it the 14 compound locomotives were also provided therewith, so that of the 26 compound locomotives which will soon be ready, nine have the von Borries and the remaining seventeen the Lindner apparatus. As the compound locomotive has only one-half as many exhausts as the ordinary locomotive, certain doubts as to whether the blowing the fires will be sufficient were warrantable before the locomotives were experimented with. However, in actual practice it is found that the long-drawn out-puff which results from the exhausting of a large volume of low pressure steam from the large cylinder is more favorable than the more rapid puffs at higher pressure from two ordinary cylinders. Without other changes in the drafting apparatus when changing to compound the fire burns brightly, and the generation of steam is fully sufficient for the heaviest work, and the action results in a marked decrease in the amount of spark throwing. Contrary to expectation, during the starting of the compound engine there has been a considerable reduction in the amount of water thrown from the stack when the throttle was first opened. Special precautions first taken to apply small safety valves to covers of the large cylinders appear to be superfluous, and the loose fitting of the cylinder cocks seems to be quite sufficient to remove the condensed water from the cylinders. The location of the receiver in the steam space in the boiler acts favorably in drying of the steam; yet, while careful experiments show that such a location of the receiver is advantageous, it probably will be found unnecessary when the steam chests and cylinders and cylinder heads are properly packed in non-conductors. The location of a safety valve on the receiver has proved to be useful, because this, aside from its real purpose of protection of the piston and moving parts connected with the low-pressure cylinder from high pressures, indicates quickly a leakage of the high-pressure steam valve or piston, and serves to show the condition of the engine. The locomotive supplied with the Von Borries and Lindner apparatus start trains almost equally well. Still, the Saxon State Railroads have given preference to the simpler Lindner apparatus, because of the ease of application and the reduction in repairs.

[To be continued in the next issue, in which will be given tables showing the comparative fuel consumption of these locomotives and of others of identical design but non-compound, and also indicator cards, 65 in number, from both cylinder at all points of cut-off and from the receiver.]

A Queer Effect of a Blast.

The accompanying illustration, made from a photograph, shows an unusual effect of a blast during the construction of the Clinch Valley Division Norfolk & Western Railroad. The masonry shown is the second pier of bridge No. 17, built by Contractor Henry Davin, of Lexington, Va., and at the time of being struck was situated about 200 ft. west from the face of an adjacent hard limestone cut, in which the rock lies at quite an angle. Not a very heavy charge had been put in by the foreman working the cut, but it blew in a different direction from what he anticipated. Instead of going upward, it took a nearly horizontal direction toward the masonry, which latter was struck by several pieces containing upward of a cubic yard or more; that is, fragments of this size were thrown 200 ft., and the effect on the masonry subjected to this bombardment is shown in the cut. The character of the masonry was of most excellent quality and workmanship, or it would not have withstood the immense shock. It was afterward torn down and rebuilt from the bottom up.

Journals and Journal Bearings—New England Railroad Club.

At the meeting of this club on Nov. 13, President Richards in the chair, the subject of Journals and Journal Bearings was taken up in a paper by Mr. F. D. Adams, Boston & Albany. A synopsis of his paper follows:

This is a subject upon which there is a great difference of opinion, but upon one point most, if not all, are agreed, and that is that the present oil box for journals of cars is and has always been, as generally used, a crude arrangement, admitting dust and grit, and allowing the oil in a limited degree to escape, thereby subjecting trains to frequent delays on account of hot boxes. This all of us well know: and perhaps there is nothing more annoying to us and to the traveller, than to have to be held up on account of a hot box. I need not say that it if unsafe to keep up speed if a box gets quite hot, as we all know that the result will be a ruined axle and possibly a break-down.

Now, what is to be done? Some one may say, "use better oil, or some of my grease." In some cases, perhaps, this will help. Or "use better waste." In some cases the quality of the waste may be a partial cause of the difficulty. Others will say, "if you will use my bearings upon your cars you would not have any hot boxes." Now while any or all of these things may require to be considered to a certain extent, with our present oil box and small amount of bearing surface, we must continue to expect hot boxes.

Now I have stated some of the causes of hot journals, but not all. Most of our trucks are so imperfectly, and I may say carelessly constructed, that with the very best oil, waste and bearings they would get hot. What we need to insure us against hot journals is good stock and good mechanism in construction. We certainly need an oil box tighter than our present standard, with its open back and crude dust guard, which is soon worn so that every lateral movement of the axle pumps in a quantity of grit, causing the axle and the brass to "wear out" long before they should, and fills the waste and oil with an ingredient that absolutely destroys its design. Now there are boxes that are comparatively oil and dust tight. Why not use them? Possibly the principal objection is the additional cost; but we cannot have a good piece of mechanism or a suitable oil box without its costing more than our old standard, with two-thirds of the covers off entirely.

I believe we ought to have, and I am inclined to think that we shall soon have a box, for our passenger service that is absolutely proof against heating at any speed, but it will cost more money. I also believe we should have a box for freight use that is cheap and much tighter at the back part of the box, and also the cover fitted properly, so it will fit close and stay where it is placed. Now I am not a prophet nor the son of a prophet, but I believe the time is not far distant when there will be some kind of an anti-friction bearing adapted to car journals of the roller or ball type, that can be produced at a reasonable cost, that will supersede all of our old-style bearings, lessening the amount of oil, and doing away entirely with waste, and reducing the friction to a very small per cent. of what it is now.

Mr. LAUDER: I agree with Mr. Adams thoroughly that one thing to be desired at the present time is something better in the way of a housing or box, better appliances in connection with the box to accomplish the purpose of excluding dust from the wearing surfaces. I have during the last three years watched the matter very closely, and I am more than ever convinced that the one thing of all others needed is a dust-proof box; it is of more importance than any material or design of journal bearing. Our present appliances for journal bearings would give us a great deal better service if we could exclude the dust and other foreign matter that enter our boxes at the end of the journal next to the wheel.

On Cape Cod we run through sand for 50 or 60 miles, and when it is dry under the cars there is just a whirl of sand, and I have seen cars come into Boston with at least a quarter of an inch of pure sand lying on the truck-bed. Under those circumstances it is absolutely necessary to have appliances to exclude that sand from the journals, and three years ago I equipped two cars with the Bemis box, which is practically dust tight. I did what perhaps others did not do at that time—I insisted on having a larger journal. I started with a 4-in. journal. Those boxes are running at the present time on that journal, and they have given so much satisfaction that we have recently bought and paid for the right to use these boxes on our new equipment, and we shall use a 4½-in. journal.

I believe the larger the journal, the less the friction, the less the necessity for repairs, the less the liability to heat. I had a journal at the Master Car Builders' Association Convention held in Saratoga last June that had run upward of 150,000 miles, and it was within $\frac{1}{64}$ of an inch of its original size. That shows what can be done if you can exclude foreign matter. I suppose in lubrication the theory has always been that a lubricant presents the absolute contact of the two surfaces. If that is correct and foreign matter like dust and grit can be entirely excluded, theoretically there ought not to be any wear. Now there is wear, which shows that the theory must be at fault, and foreign substances get between the two and abrade the surfaces and cause wear. The more you can exclude these foreign substances the less friction and wear you will have. The best box that I have yet seen for that purpose is the so-called Bemis box. Formerly with the ordinary Master Car Builders' appliances, so-called, it was a rare thing on this division of our road that I speak of for an axle to be used a second time; that is to be used with a second pair of wheels, because the journals were worn out. In fact, in some cases we have put under a pair of chilled wheels with new axles, and had to remove them before the wheels were worn out, because the journals got below the safety point. Wheels in that section rarely make over 30,000 miles; some make 40,000. We have journals running of the Bemis design that are wearing out their fourth pair of chilled wheels.

I have brought here a record of some tests which I have been making during the past year. I don't propose to let anybody use this record to advertise their boxes, or to injure any other man's box, so I will not mention by whom these boxes were made, except I will say that one set was made by the Old Colony Railroad. The other three sets, two of each kind, were of different manufactures. They made over 36,000 miles. Of the four kinds of bearings, three of them were with soft lining and one a solid brass box without any lining, and they made almost exactly the same record, giving almost exactly the same results.

The general condition of all the journal bearings and journals was *good*. Nos. 7 and 8 were of our own make. The original diameters of the journals were $3\frac{15}{64}$. It

SOME EFFECTS OF A BLAST.

Report of Four Pairs M. C. B. Standard Journal Bearings, in Service from Oct. 1, 1888, to Oct. 1, 1889, on Old Colony Smoking Car 53. Mileage, 36,877.

Mark.	Weight Oct. 1. 1888.		Weight Oct. 1. 1889.		Loss of weight in ozs.	Mileage to ounce.	Oct. 1. '89 Diam. of journal.
	Lbs.	Ozs.	Lbs.	Ozs.			
1.....	9	7	6	11	44½	829	3 45-64
2.....	9	10	6	12½	46	8.3	3 45-64
	19	2	13	7½	90½	815	
3.....	9	8	7	9½	30½	1,209	3 46-64
4.....	9	9	6	10	47½	776	3 44-64
	19	1	14	3½	78	992	
5.....	8	13	5	13½	47½	776	3 47-64
6.....	8	7	5	7	47½	776	3 47-64
	17	4	11	5	95	776	
7.....	9	8½	7	13	27	1,341	3 46-64
8.....	9	10	6	12	46½	793	3 46-64
	19	3	14	9	74	1,067	

will be noticed that the wear on journals Nos. 1 and 2 was $\frac{1}{64}$ of an inch. In some cases the journals when taken out were slightly tapered. We expect more wear at the end of the journal next the wheel than at the other end. Most of the wear is due to the dust getting in there. In some cases there was a slight difference, perhaps $\frac{1}{64}$ of an inch, and in that case we measured both ends, taking the mean as the diameter of the journal. In Nos. 7 and 8 the two journals were exactly alike, losing $\frac{2}{64}$ of an inch. Those had boxes made in our foundry. Nos. 5 and 6 had solid brass boxes. It will be noticed that No. 7 made 1,341 miles to the ounce, while No. 8 made only 793. They were on different axles, on the same side of the truck. The car was new, and also the truck frames, the boxes all new. They were treated as nearly alike as possible during the experiment, and at the end of six months the journals and boxes were removed, and a table made up like this, showing practically the same results. The boxes were all cleaned and repacked, and run six months longer, and I know of no way to make fairer experiment than this one. Not one of those brasses a was worn.

This experiment was made to ascertain the relative value of four different kinds of bearings. The solid brass makes the poorest showing; the other three kinds were all lined bearings, and they are very near together in the results obtained. I think that this experiment shows that we make as good brasses in the foundry of the Old Colony as are made elsewhere.

Mr. ADAMS: There is a brass that came out of one of our cars that has made 101,000 miles and more that is about half worn out, being one of 24 brasses that are running in three sleeping cars that are exceedingly heavy, that have been running constantly for 15 or 16 months, and not one of them has ever had a hot box. I think that is rather a remarkable record. I think you will all agree that the ordinary M. C. B. brass, with a good fair showing, will not average over 75,000 miles; 60,000 is a common run for them. On this brass there is scarcely any end wear, which is an important feature; the end wear on our ordinary journal bearings is a serious drawback. The average wear on ends I think is an inch and a half to an inch on each end, before the ordinary brass is worn out. That, of course, destroys a portion of the wearing surface, and increases the friction per square inch and tends to the rapid wear of the brass.

I believe the Bemis box is an excellent box, perhaps as tight as any in existence. The chief drawback against that box is its great cost. It costs a good deal more money than would seem to be necessary to accomplish the end desired. When we were using some of these boxes I think they figured nearly $100 per car over the cost of the ordinary boxes. I didn't mean to say anything about the box that brass ran in, which is my own, but I claim that I have effectually excluded the dust from the back end of the box, as the wear of the brasses in our cars practically shows, and they never get hot. It has nearly doubled the life of the brasses, and correspondingly increased that of the axle, and it can be had for one-tenth the cost of the Bemis box.

G. R. MENEELY: In August, 1886, through the courtesy of the Delaware & Hudson Canal Co., we were permitted to fit up their coach No. 100 with roller bearings and run it on the "Belt Line" between Troy and Albany. The car showed such remarkable ease of movement that, after several months, we were encouraged to re-equip the coach and fit up two others—one being a combination baggage and smoking car—with bearings somewhat larger, and improved in various minor respects. The three cars constituted one of the regular "Belt Line" trains, and ran for many months, giving excellent satisfaction. As under careful watching, improvements were from time to time devised, a few of the bearings were removed before wear had supervened, and the improved forms substituted therefor. The essential features of all these bearings consisted of a series of eight Bessemer steel rollers 1¼ in. in diameter, with an effective bearing length of 9 in., arranged about a collarless steel journal of 4 in., and in the later forms, 4½ in. The exterior surfaces of the rollers travelled on a sleeve of sheet steel, the whole being inclosed in a cast-iron box, the sides and top of which were of enlarged M. C. B. shape. A pedestal of proportionate width held the box in place upon the truck. The separation of the rollers in this device (for, as you are well aware, the rollers would have frictional contact along their entire length unless held apart) was effected by means of steel balls. To prevent them sharing the weight, and in order to impose upon them only a separative function, they were of slightly less diameter than the rollers, while to hold them in position and assemble the bearing rolls as closely as possible without contact, the latter were furnished with annular grooves at their ends, into which the balls snugly fitted. The lateral play, or "thrust," of the axle was taken from the end of the journal upon a wedge or bump-plate of bronze. Occasional lubrications were necessary, and an elaborate dust guard performed the double duty of keeping the box clean and preventing the too rapid egress of the oil.

I have particularized the construction of this bearing, for it illustrates, perhaps better than any I have seen, the faults which have hitherto predestined roller bearings to failure, and exhibits at the same time marked advances over earlier forms in simplicity, strength and freedom of movement.

As to its faults, there were not a few; but the principal and fatal one was embodied in the method of separating the bearing rolls. Any method of separating the rollers which creates sliding friction, whether by balls, discs, pivots, pins, or cages, is a defective method, containing the seeds of early mechanical dissolution. For sliding separative surfaces, however well lubricated, will, under tonnage and speed, soon wear enough to impair the alignment. When once the alignment is gone, a grinding process is set up at the centre of the rolls, and, increasing at compound interest in an incredibly short space of time, the mechanism is destroyed.

It was these vital faults which impelled us to design, two years since, what we now call the "Oilless Bearing." To explain its general features, I will say that there are seven rollers, interposed, as in the old device, between the steel journal and a sleeve of sheet steel, all encased in the usual cast-iron housing. At the ends of the box circular flanges project inwardly, forming fixed tracks for the separators. The separators are of steel, spool-shaped, and in contact with the rollers at the journaled ends of the latter. Driven by these journaled ends in opposite axial direction to the rollers, the separators roll out their movement upon the fixed tracks synchronously with the movement of the bearing rolls upon the sleeve of the box, and with as little friction. They are held in position by steel retaining rings running in bevelled grooves.

This construction eliminates all sliding friction in the longitudinal movement of the bearing, and retains a constant alignment of the rollers. The end rub of the moving parts, which is extremely slight—inasmuch as the journal does not move "piston-like" through the box, bu tcarries the latter always with it—is provided for in such a manner that the resulting wear is infinitesimal, needing no lubrication. By means of the steel ball recessed in the journal, the thrust of the axle carries the box with it to the pedestal jaws. Allowance is made in the jaws for this play, while the slight movement of the equalizing bar is readily accommodated by the flexion of the spiral springs supporting the truck.

As to the performances of this oilless bearing, I would say that one of the cars equipped with this device has a mileage of over 42,000 miles, by the record in the car accountant's office, and has been running on the D. & H. Limited, Troy to Binghamton, over 300 miles daily. This

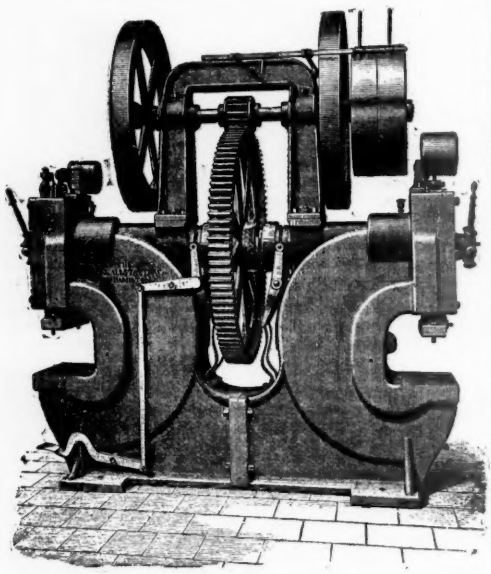
car was equipped Oct. 22, 1888, and is, therefore, now on its second year.

CHARLES H. SHATTUCK: The Tripp journal bearing is very simple in its construction, and its most important feature is its skeleton frame, controlling more or less rolls according to size of the journal. For a railroad coach we use a Master Car-Builders' size of journal, covered by a steel sleeve ½ in. thick, which increases its size one inch, on which run 26 rolls, 13 each side of centre ring of skeleton frame, giving five pairs of 1⅞ rolls always in duty, these driving the frame and bringing rolls which are out of duty to duty perfectly in line with axis of bearing, and in our device no one roll ever comes in contact with another, as where there is a rubbing friction of rolls, the contact is two surfaces running in opposite directions, thereby creating friction and requiring more perfect lubrication.

We have no strain on our pins, except the mere weight of rolls, and there being two rolls in line instead of one continuous roll, should the box from any cause be liable to roll or rise from either end of journal, one roll would revolve while the other might stop.

Our boxes are practically air-tight; the outside end of our boxes being squared up, as well as cover, and on the back end we have a packing plate with a retaining groove which holds a round flax packing with a pure rubber core, which is expansive and will keep tight the life of a wheel. We believe in using a very little amount of lubricant (vaseline), as the parts are found to be smoother than when run dry. A car with these bearings is now running on the Washington Express, via New York & New England, Erie and Pennsylvania railroads, making 381 miles each night, and has now run over 55,000 miles without losing a trip. It was tested by dynamometer on a grade of over 26 ft. per mile, at 250 lbs. starting strain.

Mr. MARDEN: If a thoroughly good roller bearing could be produced, and could be guaranteed to give good service, and not at some period of its existence when least expected refuse to work, it would be quite a desirable addition to our rolling stock, provided the expense was not so large as to overbalance the gain. We put under one car on our road, some four years ago, eight roller bearings that were of a patent issued to parties here in Boston, and similar in construction to the Tripp roller bearing. We were so much pleased with it that



Punching and Shearing Machine.

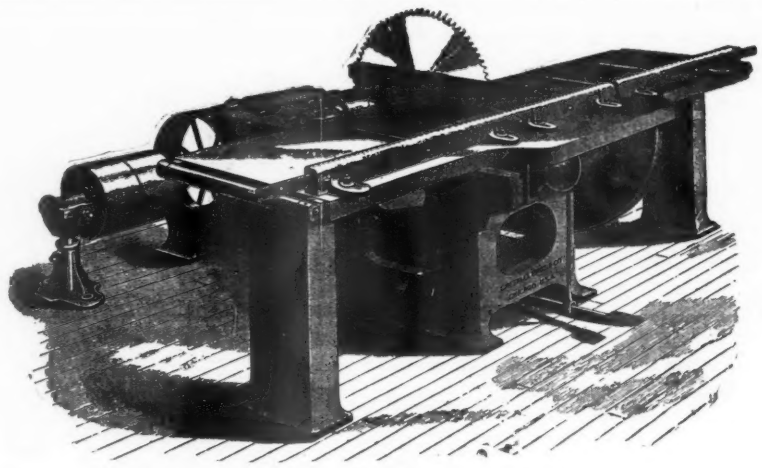
Made by the LONG & ALLSTATTER CO., *Hamilton, Ohio.*

we had ordered bearings enough to equip three or four cars. At the end of five months it was examined and pronounced to be perfect in every way, but at the end of nearly six months the thing refused to work and we had to set the car off. Now, I don't want to say anything to prevent any one from trying to use his inventive genius to give us something that would lessen the draft upon our engines and the use of oil, and thus lessen the expense of running our trains; but until something different from what I have seen yet is produced we have got to run quite a while on our ordinary journal bearing, and I think we are chiefly interested to-night, and shall be for the next five or six years, and perhaps 25, in what will give us the best service as an ordinary bearing. I think we ought to obtain at least 1,200 miles as the average to an ounce of wear on any material used for journal bearings, and we ought not to wear our journals, if our oil box is properly protected, over $\frac{1}{16}$ of an inch. It does not matter so much what kind of oil we use, provided it is a good lubricant and is fairly well cleared from grit and other impurities, and we can hold that lubricant in the oil box. If we had a box that was practically dust tight we would make a great saving for our roads, especially in our freight service.

Mr. ADAMS: While I am not perfectly sanguine about the roller bearing, I have got a good deal of faith in it, and believe the time is not far distant when we shall have a revolution in bearings, particularly of our passenger equipment, and I think the signs now indicate that before long there will be some kind of a bearing produced that will reduce friction largely. We have made a mistake in using too small bearings. It is a self-evident fact that we want a larger journal, and we are coming to that. When the 4½ in. standard was adopted the only mistake was that it wasn't big enough; I think it would be better if it were made 5 in.

One great objection which at present exists to the adoption of a standard box is the difference in the length of axles. My theory has been to aim in the construction of my box to produce one that would go on the same length of axles that we had before, and a box that would go on to the M. C. B. journal; and also on the 42-in. journal we used the same box. If we could get an ordinary journal box fitted up in the ordinary manner and keep the dirt out for perhaps $8 or $10 additional expense, I think we had better keep on in that direction before we go too far in the collar business. I have been to Fitchburg and examined the ball business pretty thoroughly, and we are making arrangements now to apply a ball bearing to a car; whether it will be a success or not remains to be seen. It has seemed to me impossible to make a ball hard enough to resist the concussions and blows that cars continually meet with. I doubt if the ball bearings can be applied to freight cars, as a different axle is required from the ordinary one.

President Richards announced as the subject of discussion for the December meeting, "Railroad Signals and Signaling," to be opened by Mr. R. H. Soule.



AUTOMATIC CUT-OFF MACHINE.

Made by MESSRS. GREENLEE BROS. & CO., *Chicago, Ill.*

Double Punching and Shearing Machine.

The figure represents a duplex machine made by the Long & Allstatter Co., Hamilton, O., either side of which can be used for punching and shearing. The Long & Allstatter Co. build these machines in 13 different sizes, each size being made with varying proportions and capacities, according to demands. The machines are also made *single* (with one set of jaws), *double* (as in the figure) *twin* (two machines side by side), *horizontal* (with horizontal movement of the slide or ram), and with independent engines connected directly to the driving shaft. The machine here represented is the No. B., and is made in nine varieties, with depth of throat from 12 to 48 in., for punching holes of from 1¼ to 2½ in. diameter in sheets from 1 to 1¼ in. thick, for shearing sheets from 1 in. in thickness by 18 in. wide to sheets 1¼ in. thick by 12 in. wide, for cutting off flat bars from 1 × 8 in. to 1¼ × 8 in., and round bars from 1½ to 2¾ in., and weighing from 14,800 to 24,500 lbs. for single machines, and from 24,500 to 40,800 lbs. for double machines.

As shown by the sketch, the frame of this machine consists of two single castings bolted together. A countershaft, with fast and loose pulleys and fly wheel, carries a pinion which gears with the large wheel on the cam shafts below, the speed ratio of the pinion and cam shafts being 7 to 1. The large gear wheel is loose on the cam shafts, which are independent of each other, but it can be connected with either or both shafts by pressing the treadles, and thus throwing into gear clutch couplings, which are secured to the shafts, and held away from the gear wheel by springs, except when the treadles are pressed down. It will be seen, therefore, that this arrangement forms two independent machines bolted together for the purpose of economizing space and driving mechanism, and the description which follows will apply to either machine of the pair. The upper jaw carries a guide for the ram or slide, which is actuated by a cam on the cam shaft working against pintals on the slide; both the slide and pintals being fitted so that they can be adjusted for wear. The slide is counterbalanced by a weighted lever. The cam shaft is of hammered steel, and is supported in bearings on both sides of the cam. The usual speed of the cam shaft is such as to give the slide from 20 to 40 strokes a minute, although a higher speed is permissible. The outer extremity of the cam shaft is provided with a capstan, into which bars may be inserted for the purpose of turning the shaft by hand and adjusting the position of the slide. There is a hook for each treadle, by which it can be held down, keeping the slide in continuous motion; and the treadle can be unhooked by a motion of the foot. An automatic stop is provided, when desired, which causes the cam shaft to make one revolution when the treadle is pressed down and released, the cam shaft stopping with the slide at the highest point of its stroke, or at any other point by adjusting the automatic attachment. A full set of tools for punching and shearing is furnished with each machine. The slide is flanged on the lower end for the reception of sheer and punch blocks, and set screws are provided for side adjustment. The slide also carries a bolted clamp, permitting vertical adjustment for punches and sockets. The bed jaw is fitted for receiving shearing and punching tools, and has adjusting set screws. An edge gauge for use in punching plates is bolted to the frame, having slotted holes so that it can be set as desired, and a pull off or stripper is provided to straddle the punch and strip the sheet as the punch rises.

Automatic Cut-Off Machine.

About eight years ago Messrs. Greenlee, Bros. & Co., of Chicago, introduced an entirely novel machine, their self-feeding saw table, which is now in large use in wood-working shops. Recently they introduced an automatic cut-off machine, which they claim will make a saving of at least one-half on heavy work, and much more than this on light cross cutting. The main advantages claimed are that the carriage supporting the saw mandrel is very long and runs in a gibbed frame, thus, practically, the saw feeds perfectly straight and is capable of very fast feeding. They attain this by the use of very simple feed works, without the use of link or leather belts to draw the carriage. The feed, being controlled by the foot, gives the operator the advantage of using both hands to handle the timber. The return feed is automatic and positive, no time being lost in starting the motion.

The cut shown is of their No. 3 automatic cut-off machine, which is designed for the cross cutting of timber as heavy as 12 in. thick. It has three rates of feed, so that light work can also be done with speed and facility. The machine is very simple in mechanism, and large and strong in every detail. Further particulars can be obtained by addressing the manufacturers.

Compound Locomotives in India.

At the last meeting of the Western Railway Club Mr. E. W. M. Hughes, Chief Engineer Fox Solid-Pressed Steel Co., Chicago, read the following paper:

If compounding is to be of any good to a railroad, it requires the converting of the whole stock of engines. The saving to be made in only new engines having the improved method would be but small to a road, and not of any appreciable value. The most important points to be considered are: Can we at a small cost convert our ordinary high-pressure engine into a compound, and in so doing make an actual gain that would justify the time and money laid out?

Early in 1882 I determined to make make my experiments, but was prevented from personally supervising the work owing to the extra duties thrown upon me in connection with the moving of troops into Afghanistan. The trials were, however, carried out to my idea on the lower sections of our roads that were within the frontier limits of India, and these trials I will now describe. See fig. 1.

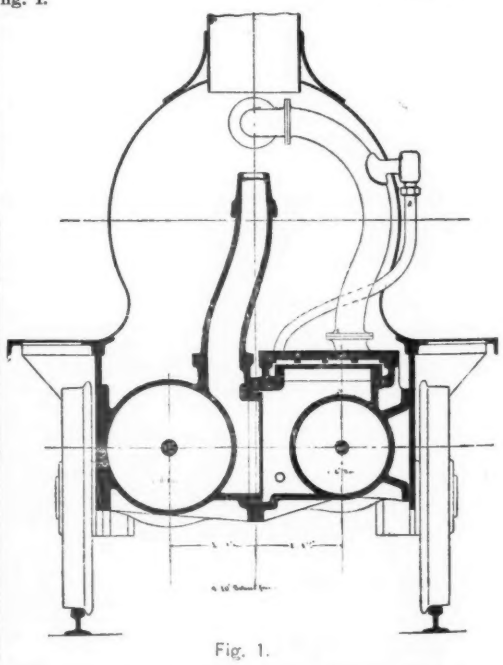


Fig. 1.

Two old engines requiring heavy repairs were taken into the shops, and upon these the alterations were made. Both these engines required new cylinders. Each had 3 ft. 6 in. leading wheels, with two pair of 5 ft. wheels, coupled with cylinders of 16 in. diameter and 24 in. stroke. In one of these engines the old 16 in. cylinders were replaced by an 18 in. high pressure and 24 in. low pressure, these being as large as could conveniently be placed between the frames. The slide valve of the low pressure was worked direct as before, but that of the high pressure through the intervention of a rocking shaft. Excepting this slight modification thus rendered necessary, the gear remained the same as of old. This

arrangement gave excellent results in working. To meet any contingency of the high-pressure cylinder sticking on a dead centre, a valve was provided by which steam was admitted direct from the boiler into the steam chest of the low-pressure cylinder.

This engine was regularly employed on freight service, and hauled 550 tons at the rate of 22 miles per hour, and consumed 13½ per cent. less fuel than an ordinary one of its own class.

The other engine altered was of the same class. It was changed to a four-cylinder compound, having a pair of outside high-pressure cylinders of 11¾ in. diameter, and a pair of low-pressure inside cylinders of 17 in. The original 24 in. stroke was retained for all four cylinders. The crank pins for the high-pressure cylinders were fixed opposite to the cranks of the low pressure. The results obtained from this engine were identical with those from its sister engine above described. It was a better steaming engine than the two-cylinder locomotive, but the latter was never short of steam.

The compounding of those two engines was a decided success. They were more powerful than in their original state, and showed a decided saving of 13½ per cent. in fuel. They were nothing new for the engineer to handle and any engineer could drive them without special study

Being old boilers the working pressure was only 120 pounds per square inch. With a higher pressure a much better result would have been attained. The conclusion I have come to from the performance of these two engines is, that it is quite possible to convert the ordinary high-pressure engine into a compound at a reasonable cost with a decided advantage. I prefer two cylinders to four for the simple reason that it is far less complicated and less expensive. I consider it is a mistake with three-cylinder engines to leave off the coupling rods, as the wear, however little, from them will be more than counterbalanced by the unequal wear produced on wheels revolving at different speeds.

In fig. 2 I show an outside cylinder engine (American type) with a pair of compound cylinders, and shall be glad

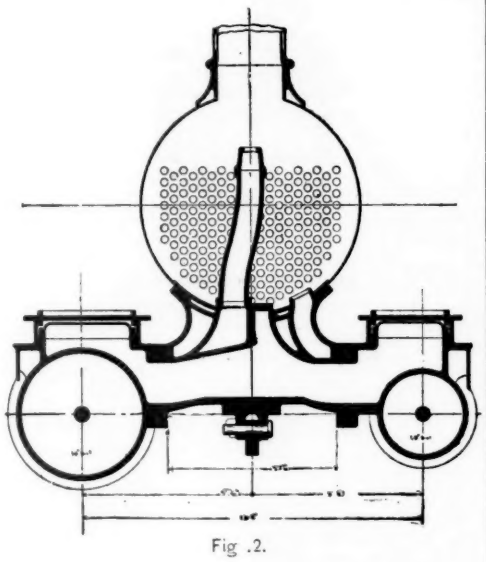


Fig .2.

to see some of our members take up the matter on these lines and give it an actual test. My experience shall be at his disposal, and I am confident the trial would result in economy to the company, and a valuable experience to the profession generally.

I think much aid could be given to compounding by some suitable means of jacketing the cylinders. It is a difficult matter to steam jacket a locomotive's cylinders, as they are carried so much below the water level of the boiler, thus making a proper drainage of the water from the jacket almost impossible. I do not see why a portion of the smoke-box gas should not be conveyed round the cylinders. I feel certain that a good system of jacketing the cylinders would lead to at least 8 to 10 per cent. higher economy in fuel.

DISCUSSION.

The PRESIDENT: You spoke, Mr. Hughes, of introducing a rocker shaft for the large cylinder.

Mr. HUGHES: I worked the low pressure direct from the old Stephenson valve as we had it. I think it was 2½ in., but I put in a rocker shaft for the high-pressure cylinder. I made one other alteration afterwards in this one. I found this worked perfectly, but I had an idea that we got a good deal of wet steam in low pressure, and so I led the exhaust from the high pressure around the smoke-box and brought it back, and found I got very much drier steam and better results.

Mr. GIBBS: Any drop in the receiver? Did it drop appreciably?

Mr. HUGHES: Not appreciably.

The PRESIDENT: Gentlemen, this subject is before the members, and being a valuable one, I hope to hear a good discussion of it. We ought to bring out all the points now, as I believe the compound locomotive is destined to become an engine that will do some service on American roads.

Mr. FORSYTH: I would like to ask if he had to alter the separate cylinders of the engine.

Mr. HUGHES: No, I kept them. I had no drawings by me for the consolidation engine at the time. I took them from the *Railroad Gazette*. I found the cylinder all right and I left it so. When I was altering the engine I altered it with the view that if anything failed I could just take out my compound cylinder and return the old cylinder and put her back on the road as she was.

Mr. SETCHELL: I understood that the saving was 13½ per cent. in both cases; the saving in fuel. I would like to ask what length of time that was based upon in the compound engine.

Mr. HUGHES: My first record was on 6,555 miles, and they have been running since 1884, and the last news I had of them was that they had got from 13 to 15 per cent. saving on those two engines regularly, and that they were better and stronger now than in the old state.

The PRESIDENT: If the improvement was as much as you said, why has the practice not been more constantly continued if there were a saving in fuel of 13½ to 15 per cent?

Mr. HUGHES: They are expecting me back, and I don't know how the matter stands, as I am not in direct communication with them now.

Mr. FORSYTHE: I believe in compound locomotives thoroughly, and I think that the way for American engineers to start is on the line that Mr. Hughes started in India. That is, to adapt the compound cylinders on old engines. I was wondering too if he was going to say anything about the area of a receiver. I noticed that the volume of the receiver in his plan was very small. I was pleased to find that he afterwards used the copper pipe going around the smoke box. There is no doubt but that is the correct principal, and that there is a real advantage, not only in getting dry steam, but in the way of economy in the use of steam. I found when I was in Europe this summer that in one of the locotive works in Manchester they are almost entirely engaged in building compound locomotives, and that in another place they had under way 40 compound locomotives. Most of these, however, were for the colonies and for distant foreign countries where fuel was expensive. In England the practice is gaining ground, although it is rather amusing and surprising to find roads under very intelligent management where one of them is running compound engines successfully and showing a very appreciable improvement in economy, while the other one seems to have no belief in it whatever, and don't think it worth while taking it up. This, I think, is more a matter of personal feeling than of scientific fact, for I think that every intelligent engineer who has studied the question of distribution of steam and the economy of steam in a locomotive will find that we have about reached the limit of maximum economy with the simple engine, where we use the steam once and then throw it away. The advantages of the compound engine have been explained here and in the papers pretty thoroughly, and among others the fact ought to be emphasized that we expect to get more power out of the locomotive at high speed. That is the weak point of the simple locomotive for passenger service. I don't know whether I had better try to explain why. That is rather difficult without using figures and diagrams. In the compound engine you can get a very much larger opening of the exhaust valve. To get a draft with a large exhaust nozzle reduces the back pressure so that at a large cut-off you get a larger area of indicator card at high speed than is possible in the simple engine. Another advantage is the more uniform pressure on the crank pin. The difference in the pressure each side of the piston in the cylinder is very much less than in the simple engine, and the consequence is there is more uniform pressure on the crank pin and a more uniform stress throughout the machine. Mr. Barnes discussed some of the means of obtaining sufficient power in starting and referred to some of the valves which are in use, and that is a matter in which I think each individual designer, perhaps, will have some preference of his own. It has been shown, however, conclusively that it is quite possible to control the steam in a low-pressure cylinder and to obtain as much pressure as desired, and it is known that the cylinder is not any smaller than the one previously used, and we could obtain as high a pressure, and that the starting power of the engine will not be any less. I don't know whether I have much more to say, except in regard to Mr. Hughes' figures that the economy which he claims is a little higher than I should expect from the use of the compound without any increase in the boiler pressure.

Mr. LITTLE: I would like to enquire what effect your method of compounding has upon the riding and motion of the engine.

Mr. HUGHES: None whatever.

The PRESIDENT: Mr. Hughes, with a higher boiler pressure you would expect better results?

Mr. HUGHES: Much better.

The PRESIDENT: Did you have any trouble in starting?

Mr. HUGHES: None whatever. We managed that with that one valve letting steam in the receiver; live steam from the boiler.

The PRESIDENT: You were to do that with a separate valve?

Mr. HUGHES: It was my intention to make it automatic afterward; but for experiment I didn't want to go to any extra expense at the time. We had to decrease the nozzle by half an inch in diameter on the two-cylinder engine, and it was a much freer steaming engine than the four.

Mr. FORSYTH: The effect is not as bad as Mr. Gibbs anticipates, because there is a much larger volume of steam going out from the low-pressure cylinder, and it has a very much steadier blast than that produced by the simple engine.

Mr. GIBBS: It seems that that might be the saving clause in the effect. We have thought of that and have tried to devise some means of obtaining a better exhaust, and we propose to use a smaller nozzle and not have it come out so constantly—act as a continuous blower instead of an intermittent.

The PRESIDENT: I would like to ask Mr. Forsythe, in his experience in England, if he can say whether they had better results with cylinders being set tandem or side by side?

Mr. FORSYTH: I think the only tandem machines I saw were at the Paris Exposition. I did not see any in use in England. The favorite method I saw throughout Europe is the two-cylinder engines.

The PRESIDENT: Were the results attained as favorable as those obtained by Mr. Hughes?

Mr. FORSYTH: The average results were about the same as stated by Mr. Barnes, about 15 per cent. It is obtained by the use of high-pressure steam of about 180 or 200 lbs. In reply to Mr. Setchel I will say that these figures are not based on any little trip tests, but are the results of careful measurements extending over several months. The only place I know of where very high pressure is used is on the Caledonian road. I believe Mr. Drummond is now trying to find out whether he can get as much advantage from high-pressure with a simple engine as they could from a compound, and I quite expect he will be disappointed.

Metal for Brake Shoes.

At the last meeting of the Western Railway Club Mr. E. C. Case, General Manager St. Louis & Hannibal Railroad read a paper on the Best Metal for Brake Shoes. An abstract follows:

In the use of brake shoes three forces are noticeable: First, the momentum of the wheel; second, the pressure used in the application, and these two produce the third force, viz., friction, which acts as a retarding force to the first.

The first cannot be controlled and in the second we are limited by the weight of the car, or engine, and by other circumstances which make only a certain force permissible for the well being of the journals, bearings and boxes, and, owing to this, the force used to produce the required friction, the better all interests are served; hence it behooves us to find by some process of experiments or reasoning from known facts that metal which will produce the greatest friction in a given time by the application of a reasonable pressure.

Whenever friction is produced, it will be found accompanied by a wearing away of the parts producing it; in fact, friction may be said to be measured by the force required to detach and remove from the larger bodies the small particles that are worn off; hence where all the conditions remain the same, the greater wear the more friction produced.

It needs no argument to prove that particles can be detached or worn off from a brittle metal with less force than from a tough metal; therefore, it is plainly apparent that for friction a tough metal is needed. Tough metals, however, may differ in point of hardness; therefore the next question would naturally follow: How hard should we have it?

It should be borne in mind that two forces are necessary to produce friction, one that brings the two surfaces in contact, and the other, at a right angle with the first, causes the separation; and that the friction is measured by the latter force. If a file be applied on soft metal it is found that a strong force is necessary to push it under a light pressure, while on hard metal it can easily be pushed under a greater pressure, thus it is clear that on a soft metal a greater friction is produced than can be on a hard metal with the same pressure.

It cannot be doubted but that in removing a given quantity from a hard, tough metal a greater quantity of friction will be produced than in removing the same quantity from a soft, tough metal, but it will require longer time and greater pressure to do it.

A train must be stopped in a given time, which requires a certain amount of friction to be produced in that time. Hence a metal is needed soft enough and tough enough to produce that friction in the given time under the limited pressure that can be used. Therefore, to meet the requirements as to friction, it would seem that the metal selected should possess those qualities characterized as soft and tough.

This statement would seem to be verified by the experience of a representative of the Westinghouse Air Brake Co., who stated at the last meeting of this club that he had recently been called to examine the braking apparatus on a train that was reported as not "holding," and that he found no trouble with its "holding" after he had removed the hard shoes in use and substituted soft cast-iron shoes; in other words, the hard shoes would not produce the necessary friction in the required time under the limited pressure permitted, while the soft ones did.

In applying brake shoes another effect is noticeable, namely, heat. Under continuous or frequent application of the brakes it will be found that the temperature of the metals producing the friction rises very high; in fact, upon mountain roads it is found necessary to stop occasionally to cool the shoes and wheels.

We believe that the loosening of tires is due wholly to the excessive heat generated by the application of brakes or cutting of journals.

This excessive heat also has a tendency to destroy the chill of the wheel and thereby cause it to be more easily flattened when skidded, as it naturally wears faster after the chill is destroyed.

Manufacturers of chilled wheels claim that it is dangerous to bring the temperature of a chilled wheel up to 300 degrees, particularly because of their liability to crack by rapid cooling from that temperature. And again with steel tires it is found they invariably get so hard that it is almost impossible to turn them up; the cause can be traced to the same agent, heat. While there are other and better agencies for the purpose, yet atmosphere will absorb heat rapidly enough to harden steel, and what is commonly called case hardening of tires is undoubtedly the effect of rapid cooling after the application of the brakes.

The wheel being the larger body keeps cooler in proportion than the brake shoe, and iron being a better conductor than air it necessarily absorbs a portion of the radiation from the shoe. Hence any device that will keep the temperature of the shoe down will likewise effect the wheel in proportion; to hold this heat in check it is necessary to destroy, as far as possible, the conducting properties of the shoe. We find that this can be done by inserting in the face of the shoe a soft metal or alloy, which, being a very poor conductor of heat, has the effect of breaking the current, and the temperature of both shoe and wheel are thus held nearer normal, and in the proportion that this is done the wear of the shoe and wheel is reduced and the undesirable effects, the cause of which has heretofore been traced directly to the high temperature of the shoe and wheel, are avoided.

We have made some tests for the purpose of determining to what extent this heat could be held in check, with the following results: Under the given conditions the actual heat generated in a cast-iron shoe was 560 degrees, or nearly four times that of the composite metal shoe, which was 145 degrees, and in the wheel, under the cast-iron shoe, 195 degrees, or more than double that of the wheel under the composite metal shoe, which was 95 degrees. The normal temperature at this time was 65 degrees, which should be added to the above figures to obtain the actual temperature reached by each. We have also made many stops with the composite metal shoe in comparison with the cast-iron shoe, in which we found that we could stop in as short time and distance as with the ordinary cast-iron shoe.

We have made some preliminary stop tests with cast and wrought shoes to determine the relative friction and wear under varying circumstances, and while as yet we have no accurate statistics to offer, we have learned enough to convince us that practice will demonstrate the truth of the foregoing statements.

We have found that the wear of the cast-iron shoe is greater as the heat rises, without any increase in friction, and have also found that the wrought shoe will show much less wear than the cast shoe, but at the expense of far greater wear on the wheel, so much as to be an impracticable metal for brake shoe purposes.

We then recommend a soft cast-iron shoe with a softer metal than the body inserted in its face.

DISCUSSION.

The PRESIDENT: Have you had much experience in the plain steel shoe?

Mr. CASE: No, sir, we have not. We have used the steel and cast-iron shoe with pieces of steel inserted throughout the face of the shoe.

Mr. RHODES: Mr. Case says that he realizes the importance of the effect of heat on the shoe, and states that under identical circumstances the actual heat generated in a cast-iron shoe was nearly four times that which the composite metal shows, and in the wheel under the cast-iron shoe more than double that of the wheel under the

composite metal shoe. I would like Mr. Case to explain to us as near as he can how they arrived at the temperature of these different shoes under as nearly as could be identical circumstances. The statement is made: "We found that the wear of the cast-iron shoe is greater as the heat rises without any increase in friction. I see in last week's paper (*see Railroad Gazette*) that I have been associated with two other members, Mr. Verbryck and Mr. Wall, to make a report on this subject to the Car Builders' next annual meeting, and these points will be very interesting and very important, and if these experiments are the best, we would be very glad to avail ourselves of such as we can get, and if we can improve on what Mr. Case has done we are very anxious to do so.

Mr. CASE: I would state that a set of cast-iron shoes was put upon a coach and also a set of composite shoes, and a run of several miles was made on the road with the brake pressure on each truck being alike, and at various stops the temperature of the shoes and wheel was taken with a thermometer.

In regard to the other question, a machine was arranged in the shop wherein the frictions of the shoes were measured. We have only been running this machine during the last four or five days, and we have not arrived at results which should constitute an accurate comparative test; but have learned sufficient to know that the friction does not increase under the cast-iron nor the wrought-iron shoe as the heat generated.

Mr. RHODES: In taking the temperature of the shoes, were the thermometers permanently attached to the shoes or were they placed there and left for a short time?

Mr. CASE: The thermometers were taken and attached to the shoe immediately following every stop, and were held by the hand on the shoe and on the wheel.

Mr. VERBRYCK: The metal is put in alternate sections in the shoe after it is cast.

Mr. DRIGGS (Composite Metal Shoe Co.): We had a small shoe constructed that could be brought to bear by a spring pressure equal at all times, and the friction was weighed at the time of starting and weighed again at the expiration of 2½ minutes, and the temperature taken. The thickness of the shoe was measured to the one-thousandth of an inch. We found that in a run of two minutes and a half the shoe had worn away about $\frac{5}{1000}$ of an inch and the temperature had run up between two and three hundred degrees. At the expiration of five minutes the temperature had increased somewhat, and the wear was from three to four times as great as it was in the first 2½ minutes. The machine was kept running up to 20 minutes, and the same proportion of wear held out as the temperature rose.

Mr. SNOW: We have always used a wrought-iron shoe up to a couple of years ago, and had very good success. We tried cast-iron shoes and also several others, and the wrought-iron shoe beats them every time. My experience is that a wrought-iron shoe will outwear about eight cast-iron shoes. The Congdon shoe comes up pretty close to it, but it does not beat it. We use a cast-iron shoe on the steel-tired wheel.

The PRESIDENT: Mr. Snow, you said the wrought shoe would outwear about five to seven times that number of cast shoes? Do you base this on the same number of square inches in contact with the wheel?

Mr. SNOW: What I mean is, we put a cast-iron shoe on one end of the brake beam and wrought-iron on the other. Yes. Our wheels run fifteen to thirty days on these suburban trains with a wrought-iron shoe and a cast-iron shoe will not last three days, and sometimes will not last more than a trip out to Englewood and back.

The PRESIDENT: What are the evil effects of wrought iron, if any, on the steel tires?

Mr. SNOW: We found that wrought-iron shoes wear away the tire too fast.

Mr. DRIGGS: I took a wrought-iron shoe that was 4 in. long by 1 in. wide, and ground it down to a bearing before we made a test with a pressure of about 400 lbs., and wore it down to a bearing, but found about as much worn off the wheel as off the shoe. We also found that the heat generated by friction under the wrought-iron shoe was very much in excess of that under the cast-iron shoe.

Mr. RHODES: This paper has brought up points which we have not considered as carefully as we might before. Now, on the part of the Master Car Builders' Association Committee, I will say that we expect to go to work very soon. We expect to hold a meeting in Chicago on Wednesday, the 18th of December, the day following the Western Club meeting. The committee propose to extend an invitation to the different representatives of brake shoes, and ask them to meet with the committee for the purpose of discussing what should be proper tests for brake shoes.

An important point, of course, to be brought out, is the temperature of the shoe at different times during the stop, and also it is important to determine the friction at different periods during a stop. I am a little surprised at the statement in this paper that the tests that were made show that the friction of cast-iron shoes did not increase as the heating increased. I am in hopes that the representatives of the different shoe companies will all give the matter some attention between now and next month, by helping the committee with suggestions, and that we will be able to show the true value of the different shoes both in their capacity to retard trains and for wearing, and their values in dollars and cents.

The PRESIDENT: It looks reasonable to think that the friction would not increase as the temperature decreases. It is generally supposed as a box or bearing heats it increases the friction, and of course it is a fair supposition that a wheel and a shoe would do the same.

Mr. DRIGGS: We think that the friction does not increase as the shoe gets hotter. We had one test where we run the temperature of the shoe up to over 400, and the friction remained at 135 lbs. all the way through from the starting of the machine until it was stopped. We had one case, the very first test we made, where we thought the friction increased as the heat increased; but we found afterward that we hadn't the shoe down to a bearing when we started, and it was found out that the friction increased by reason of the increased surface that came in contact with the wheel. We also found that the friction, as compared with the pressure, was greater under slow speed than under a higher speed. We also found that the co-efficient of the friction was greater under a light pressure than it was under a heavy pressure.

Mr. CLEAVER: I know a wrought shoe is very durable and the cast-iron shoe is not. The comparison is about as a week is to six months, as far as the wearing was concerned. As I understand it the more metal wears off the more friction. What is claimed for the soft shoe here to-day is that it produces more friction and less wear. It seems to me there is a conflict there.

Mr. FORSYTH: I have been waiting for somebody to dispute the philosophy that has been offered here in explanation of the results obtained. The use of anti-friction metal to produce friction in a brake shoe is certainly a paradox, and the philosophy which is offered here to sustain that paradox is not sound. I do not believe that this soft metal is a practical thing for a brake shoe, and there are two simple reasons or objections to it. The one is that brake shoes when worn are blue, indicating a temperature above 900 degrees, and it shows that every brake shoe has attained that temperature; so that if this soft metal at a low melting point is used in brake shoes it will be melted out before any great braking power is attained. Another result from the use of soft metal would be the accumulation of sand bedded in this soft metal, which would make the shoe act like a piece of sand paper, and wear the wheel away very rapidly. The results which have been reported here I do not consider of any value, because the fact of putting a bulb thermometer on a brake shoe in a current of air that is liable to be variable in the wind cannot give accurate results.

The reports on temperature are not of much value because they give a comparatively low temperature, and the very fact that that metal would melt out at a practical temperature obtained in railroad practice has prevented them from carrying the experiments far enough to obtain any information which is valuable on the high temperature.

Mr. SNOW: We have tried mixing steel when casting. We have made them a little harder and have found that they were a little better than the others.

Mr. DRIGGS: It is true that a hard cast-iron shoe may reach a very high degree of heat, and as we found in our experience there is no more friction at that degree than there is at the start. The heat that is in the shoe at that time is not the result of the friction that is being produced at that time, but it is an accumulation of heat that we are striving to prevent. We do not claim to prevent the generation of heat, but to prevent the accumulation of it.

Mr. FORSYTH: I claim that the method of preventing that accumulation is not explained in this paper on sound principles. There is a theory there presented about counter-currents I have not seen, and I defy any one here to find it in any scientific book. The paper says that the philosophy teaches that; but this is a philosophy that is not contained in any of the text books.

The Wells Light.

This light appears to be well adapted for night work on railroads in tracklaying, clearing wrecks, etc. Fig. 1 shows the construction of the very simple apparatus. It consists of a steel tank fitted with a hand pump and a vertical pipe, which conveys the oil from the tank up to the burner. The pump is for either oil or air. The operation of pumping in the oil compresses the air already in the tank until a pressure of about 20 lbs. is produced; when this pressure falls, as it will do as the oil is slowly consumed, a few strokes of the pump every three or four hours is sufficient to raise it to the limit pressure again.

In starting the lamp the burner is first heated by the

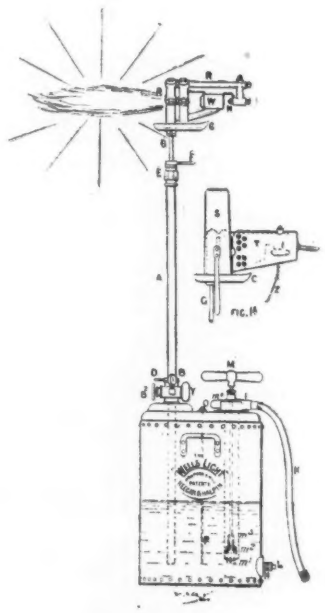


Fig. 1.

flame of a small quantity of oil burned in the dish shown beneath it; this preliminary flame being protected from the wind by a sheet-iron chimney, as shown in fig. 1. When properly heated, the valve is turned on, the oil being forced by the pneumatic pressure ascends into the hot burner, where it is converted into vapor and issues from the jet in a powerful, horizontal flame. This flame keeps the tubes hot, so that when once started the light is practically automatic. Oil or air can be pumped into it as previously explained without stopping the light. The whole apparatus is simple and well designed, every part being arranged to be protected from injury as much as possible.

The light is made in three sizes. First, a tank weighing when full about 250 lbs., and giving a light of about 1,500 candle power. Secondly, a size which railroads will doubtless find useful, namely, "The Railroad Size," shown in fig. 2. This has been especially designed for wrecks where extreme portability, combined with large flame power, is a prime necessity. The tank is welded solid, and is of very thin sheet steel, 14 in. in diameter and 20 in. in height. The whole apparatus complete and full of oil weighs 170 lbs., and can be handled easily.

The burner is unaffected by the weather, as the generating surface is largely in excess of that required; while the horizontal direction of the flame allows it to be swiveled around so as to run with the wind and keep steady.

The smallest size, which will be found useful for small

Fig. 2.

repairs, tracklaying, etc., weighs when full about 70 pounds, and may be carried by a boy, as it is furnished with a single handle fitted in the crown of the tank.

These lights are already largely used on the Continent and in England, and many engineers must have seen the fine exhibit of them in the Paris Exposition just under the Pont de Jana. Most of the large English lines employ them for wrecking work.

The lamp requires no skilled attention. On the Manchester ship cahal 200 are in nightly use under the charge of British "navvies." The sales there last winter were very large and Messrs. Keegan & Halpin, Washington street, New York, have been made sole manufacturers here, and expect that the demand here will be even greater than it is abroad.

The American Society of Mechanical Engineers—Twentieth Meeting.

The tenth annual meeting and the twentieth meeting of the American Society of Engineers opened with a "housewarming" Monday evening, Nov. 18, at the recently established Society headquarters, at No. 64 Madison avenue, which are now occupied by the secretary, while for the convenience of members the library and reading room are open every evening from 7 to 10. The business sessions of the meeting were at the Academy of Medicine, 12 West Thirty-first street, about 200 members being present.

The meeting was called to order by President Henry R. Towne, whose address was received with marked attention. After congratulating the members upon the continued growth and prosperity of the society, he gave an exceedingly interesting narrative of the engineers' trip in Europe during the past season. His remarks upon the proposed International Exposition of 1892 were intended to bring home to the American people an idea of the gigantic character of the undertaking if it was proposed to eclipse all previous efforts. He did not believe we could hope to equal the Paris Exposition in artistic features, although we might equal it in our mechanical display. After noting the various exhibitions of a similar character, dating from the World's Fair of 1851, he said we should require an acreage of from 80 to 100 under roof. In 1892 our population and railroad mileage will have doubled since the Centennial Exposition of 1876. If that of 1892 is to be international in character it must be held in New York City, for the reason that foreign exhibitors have practically no knowledge of any other American city.

"Understand me, however," said he, "I am not in favor of holding it in 1892. We have only 29 months to get it up in, and the time is insufficient. True, we may hold a big fair in some of our large cities, but it will not be an event that the American people will look back to with pride. It is our duty to tell our countrymen our need of more time for preparation, regardless of where it will be held." He presented statistics regarding the Paris Exposition, showing that the average week-day attendance was 125,000; Sunday, 300,000, while the largest number of visitors for one day was 405,000. The railway traffic showed an increase of 40 per cent. There was a total of 5,000,000 French visitors, and 6,500,000 foreigners, the latter being the more liberal in their expenditures. Esti-

mates of the amount of money disbursed by this vast throng ranged from $250,000,000 to $358,000,000.

Turning to engineering affairs, he quoted from the address of Mr. Holley, the first president, as to the future of mechanical engineering, showing how accurately his ideas had been carried out. He believed, however, that the time was approaching when one national society would be organized, including all the best engineering talent of the country. This, however, would not replace the work that was now being done by local societies. This was especially important in considering their relations with foreign societies. He advocated the provision of suitable facilities for conducting special investigations, and the continual increase of the society's library, the fund for which was steadily growing, under the system of voluntary additions to dues of members for that purpose.

The report of the council showed a gain of 178 members during the year. The receipts and expenses were about equal, being about $13,500. The present membership is 1,049, including those elected at this meeting.

A voluminous report was presented by the committee on test pieces. A report from the Committee on Standards was presented by Coleman Sellers, incorporated in which was a bill which it is proposed to introduce at the coming session of Congress, authorizing the establishment of a Bureau of Standards, where standards presented by engineering societies shall be registered.

The following is an extract of their report and bill:

We present herewith a resolution looking to the appointment of a committee to further the matter of Congressional legislation on the subject, and looking also to practical operations under the legislation in case the same should be secured, and we recommend the passage of the resolution giving the society's approval of the installation of a Governmental Bureau.

Herewith is a draft of an act of Congress looking to the establishment of the desired bureau, and we suggest substantially such an act as the basis of operations of such committee. Respectfully submitted,

JAMES W. SEE,
COLEMAN SELLERS,
OBERLIN SMITH.

Resolved, by the American Society of Mechanical Engineers: That a committee of three be appointed by the President, such committee to be known as the Committee on Standards. That it shall be the duty of such Committee on Standards to use all reasonable efforts to secure such Congressional legislation as will provide a governmental bureau of record wherein may be entered approved standards, for the promotion of uniformity in the products of the arts, in technical customs and in nomenclature. That in the event of such legislation being secured and such bureau provided for, it shall become the duty of such committee on standards to file, on behalf of this society, applications for the entry of such standards as the society may hereafter from time to time approve.

Resolved, By the American Society of Mechanical Engineers:

That in the opinion of this society, having about 1,000 members engaged in the manufacturing industries of the country and in allied professional pursuits:

First. The time has arrived when practical standards of uniformity based on a common understanding are essential to industrial business and professional pursuits.

Second. A large number of practical standards of respectable recognition and approval are now in use, but without authentic record;

Third. Systematic procedures in the matter of recording such approved standards would tend toward the inauguration of many other greatly needed standards, tending toward uniformity and interchangeability of merchantable products, in improved codes and signals, and in scientific nomenclature.

Fourth. Provision should be made, under Governmental auspices, for a place of record for standards having respectable recognition and approval.

Standards for the Promotion of Uniformity and Interchangeability in the Products of the Arts, in Codes, Signals, and Scientific Nomenclature—An Act to authorize the Entry of Standards in the Patent Office.

Be it enacted, By the Senate and House of Representatives of the United States in Congress assembled, That proper and clearly defined standards of dimension, form, capacity, composition, symbolism, equivalency, constituency, definition, test, signification, grade, designation, or mode of procedure may be entered in the Patent Office, and printed copies of such entries furnished to the public at prices as charged for printed copies of the specifications and drawings of patents. That each application for the entry of a standard must show the approval of an organized association of individuals respectably representative of some art, industry, profession, or branch of trade or recreation concerned with such standard, or of the head of some department of government, or the chancellor of the Smithsonian Institution. Each application for the filing of a standard shall be accompanied by a specification setting forth the nature and object of the standard, and containing a clearly defined summary thereof, together with such drawing, model, sample, or other monument as may be requisite. When free from objections the applications shall be indorsed as approved, and thereupon notice shall be given in the *Official Gazette*, and reasonable opportunity shall be given the public for the filing of objections, and for the overcoming of such objections by the committee in case the objections should be held to furnish proper cause for rejection of the application. Upon final approval the application shall be passed to record and issue, and thereupon the specification and summary, and drawing, if any, shall be printed and shall be noted in the *Official Gazette*. That the standard as recorded and printed shall be captioned United States Standard, and shall be given a brief appropriate title, a serial number, and a date of issue, and shall designate the society or government officer empowering the application for the entry. That the Commissioner shall furnish copies of monuments or samples or parts thereof to all persons making proper request therefor and paying in advance the cost thereof. That no standard once entered to record and issue shall be canceled or corrected, but other standards may be entered *de novo*.

SEC. 9. That the object of this act is to facilitate commerce between the states by furnishing a repository for entries of approved standards, and that nothing herein contained shall of itself be taken to bind any person to conform to any entered standard.

The first paper presented was prepared by Mons. V. Dwelshauvers-Dery, of Belgium, entitled, "Table of the Properties of Steam—Their Use in Study of Steam Engine Experiments."

In reply to the criticisms of Professors Denton and Spengler, Professor Thurston, who had prepared an introduction to the paper, stated that the tables contained therein were used by the author in his own work, which was not considered complete, but merely tentative.

The paper by Horace B. Gale, on the "Theory and Design of Chimneys," received attention from Prof. Denton and Mr. Kent, who thought it should be revised, as it contained a palpable error in reasoning.

Prof. R. H. Thurston then presented a paper on "The Philosophy of Multiple Cylinder or Compound Engines." His favorable opinion of jackets was the chief point of the discussion which followed, it being the opinion of those who took part that he placed too great stress on their saving, which was given as about 20 per cent.

Prof. Thurston, in reply, stated that this figure was not intended to apply to compound engines, but was based on general experience.

At the opening of the afternoon session, Nov. 19, the tellers reported the result of the election of officers by letter ballot to be as follows:

President, Oberlin Smith of Bridgeton, N. J. Vice-Presidents for two years, Joel Sharp, of Salem, O.; George W. Weeks, of Clinton, Mass., and De Volson Wood, of Hoboken, N. J. Managers for three years: Prof. Jas. E. Denton, of Hoboken, N. J.; C. W. Nason, New York City, and H. H. Westinghouse, of Pittsburgh, Pa. W. H. Wiley, of New York, was re-elected Treasurer.

Prof. C. H. Peabody presented two papers on the "Flow of Steam through Orifices," and the "Experimental Study of the Different Types of Calorimeters."

Professor Spengler stated that since the appearance of a previous paper by Professor Peabody on calorimeters, he had endeavored to repeat the experiments of the author, but although the instruments were carefully calibrated and every precaution taken, his results were unsatisfactory.

Prof. Denton said he believed that the errors arising from the use of a barrel calorimeter were due to improper manipulation, the imperfect weighing of water and reading of temperature. It was not as desirable as the more modern instruments.

Mr. McBride stated that he had made 80 experiments, in which the error varied from 1½ to 9 per cent. He obtained two or three negative results showing superheating. He thought the barrel calorimeter was sufficiently accurate; but Prof. Peabody in reply asserted that the range of error mentioned was too great. It should be less than two per cent.

The next paper was presented by L. S. Randolph, on the

COST OF LUBRICATING CAR JOURNALS.

In studying the subject of the lubrication of car journals, the writer was led to the conclusion that the usual lubricating tests of coefficients of friction, durability, etc., were unreliable, as they did not pretend to reproduce the conditions of actual practice, giving neither the wear on the journal—which is more important than the coefficient of friction—or the action when the journal was "flooded" with the lubricant, the condition which it obtains in good practice.

In order to overcome these objections, the following method was devised by the writer, which can perhaps be best explained by describing a test recently made, the official report of which is as follows:

REPORT OF TEST OF K. LUBRICANT.

Test commenced July 18, 1888; test completed Sept. 30, 1888.

No. of journal or brass.	Diameter of journal or weight of brass. Before.	After.	Am't wear.	Remarks.
Journal.				
1	$2\frac{31}{32}$	$2\frac{7}{8}$	$\frac{6}{32}$	With lubricant.
2	"	"	"	" "
3	"	$2\frac{27}{32}$	$\frac{5}{32}$	Oil used as stan'rd.
4	"	$2\frac{28}{32}$	$\frac{4}{32}$	" "
Brass.	Oz.	Oz.	Oz.	
1	97½	72	25½	With lubricant.
2	100½	71½	29	" "
3	108½	93	15½	Oil used as stan'rd.
4	101½	84	17½	" "

REMARKS.

Amount of lubricant used, 15 lbs.; amount of oil used, 2½ gallons = 18½ lbs.; duration of test, 73 days; mileage, 8,511 miles.

Test was made on east truck of baggage car No. 12. Weight on journal about 5,000 lbs., probably varied from 4,000 to 6,000 lbs.; maximum speed, 40 miles per hour.

Box packed with lubricant ran slightly warm all the time; box packed with oil seemed to be same temperature as the atmosphere.

The method of comparison is as follows:

X = relative value of the two lubricants, the standard being taken as unity.
a = value of brass per ounce wear.
b = value of journal per $\frac{1}{32}$ ounce wear.

These figures are obtained by dividing the total value of the piece in place less the value of the scrap, by the amount in ounces, or sixty-fourths of an inch, necessary to be worn off before the piece is condemned.

ζ = wear of brass in ounces.
z = wear of journal in sixty-fourths.
m = mileage.
$\zeta' z' m'$ = similar values for the standard.

We then have

$$X = \frac{(a\,\zeta' + b\,z')\,m'}{(a\,\zeta + b\,z)\,m} \qquad (1)$$

As a rule $m = m'$, but cases arise when that is not the case.

Applying the formula, we have first to determine the constants a and b.

The average weight of the brass is 104 oz.; this, at 1.2 cents per oz. = $1.25. Allowable wear, 38 oz.; 104 — 38 = 66 oz. scrap at ½ cent per oz. = 33 cents; hence net value of brass = $1.25 — 0.33 = 92 cents; $\frac{92}{38}$ = 2.4 cents per oz. = a.

An axle weighs about 350 lbs.; at 2.4 cents = $8.40 + labor = $10; deduct 300 lbs. scrap at one cent = $7. Three-quarters of an inch wear will throw an axle out of service; hence $b = \frac{7.00}{48} = 14.6$ cents. Substituting in equation (1), we have $X = 0.69$.

The oil used as a standard was an ordinary straight, reduced petroleum about 24 degrees B. and 15 degrees F. cold test, and cost about eight cents per gallon delivered in carload lots.

The value of the lubricant, taking into account the amount used, would be

$$\frac{18.2}{15}\,0.69 = 0.83, \qquad (3)$$

which with standard at 8 cents per gallon = 66.4.

As a rule the amount of lubricant or oil used is not regarded, as there is so much waste, and so much is dependent on the condition of dust-guards, etc., that any attempt to regulate the amount consumed would vitiate the results to such an extent as to make them practically worthless.

When the co-efficient of friction can be obtained with any degree of accuracy, it is well to take into account the relative amounts of coal consumed. This would give to equation (1) the following form:

C = value of coal consumed per mile per pound of train resistance.
W = weight on journal in pounds.
f' = co-efficient of friction of standard.
f = " " lubricant.
d = diameter of journal in inches.
d' = " wheel "

The frictional resistance would be $= Wf \times \frac{d}{d'}$ and the value of the coal $= C\,Wf \times \frac{d}{d'}$, and formula (1) becomes

$$X = \frac{\frac{(a\,\zeta' + b z')}{m'} + C\,Wf'\frac{d}{d'}}{\frac{(a\,\zeta + b z)}{m} + C\,Wf\,\frac{d}{d'}}$$

Assuming a coefficient of friction for the standard of 0.01 and for the lubricant of 0.04, which are about the values they would have given, we can apply equation (4) to the test described.

To obtain the value of C, we have one pound of coal of about 14,000 B. T. U.; calorific value would give 10,808,000 ft. lbs. of energy. This, with a boiler efficiency of 40 per cent., and an engine efficiency of 10 per cent., would give 432,320 ft. lbs., hence $\frac{5040}{432320} = 0.012$ lbs. coal per pound per mile of resistance.

With coal at $1 per ton, C would be equal to 0.0005 lb.

Substituting these values in equation preceding,

$$X = \frac{.0123 + .0025}{.0179 + .01} = 0.53.$$

In this formula the first quantities in the numerator (0.0123) and in the denominator (0.0179) are from the wear of the journal and bearing; the others are due to coal consumed. It will be observed that the former, being much larger, have a much greater effect on the value of f than the latter, and consequently that the wear of journals and brasses is a much more important factor than coal consumption.

The value .04, assumed for the co-efficient of friction of the lubricant, is somewhat high, but about correct, as it was undoubtedly a very poor lubricant.

DISCUSSION.

Professor Denton stated that he believed this to be a great advance in the method of testing lubricants. Most of the railroad laboratories had decided that the greatest cost is in the brasses. The lubricant used in these tests was what is called a "cooling" compound. These compounds are made of grease mixed with talc, sulphur, or bituminous coal. The particular compound used in this case contained bituminous coal. Such a compound wears the journal more than oil. The theory is that if you can get it on to the journal, just as the heating begins, the roughened surface will be polished off by the compound. It is a good thing for a hot box, but if used as a lubricant it causes more wear. The metal wear costing one cent, the cost of fuel is one-third, and oil one-sixth. He had suggested this method of practical tests to two different railroads, but they had found that the greatest wear was on the ends of the journals, and this defeated the object of the tests. The data obtained however by such a method was exceedingly valuable.

Mr. Woodbury added that the actual determination of the co-efficient of friction by dynamometer tests was one of great delicacy. He had made tests of journals years ago by the use of two thermometers; one resting on a thin copper tube inserted right down to the journal and the other just outside. He had seen this identical method practiced in Paris during his recent visit to Europe.

Mr. Partridge said that a few years ago there was a freight train running to Newburg where the engine hauled all the cars it possibly could. Some person in authority came to the conclusion that 60 cents was too high a price to pay for oil, and a lower grade was purchased at 40 cents. It was then found necessary to take off one car, as the engine could not haul the same load.

In reply to a member who thought the bearings might not always be in alignment, Mr. W. S. Rogers said that in the tests referred to in the paper, the alignments were all right. He had had some experience with hot boxes. The practice on the Northwestern roads used to be to be to take out all the lubricant, fill the box with sand and run about 15 miles. Then pack it with good tallow and they had no more trouble. If no tallow was to be had they bought candles from the first store they came to. On the Baltimore & Ohio road they used to have a good many hot boxes. Their lubricant was all right, but their brasses were poor, and they found the best thing to do was to steal brasses from the Lake Shore cars.

Mr. John Dick said he had seen an experiment made with "brasses" made of pure copper; oil was put in the bearings, and they were run 600 miles; at the end of the test the pure copper boxes showed less wear than the others.

The paper on "Steam Pipes for Collieries," by E. F. C. Davis', awakened considerable criticism on the use of packing for flange joints. Prof. Sweet said the best way to join steam pipes was to face off the flanges in a lathe and put them together dry with plenty of bolts. In reply to Mr. Oberlin Smith as to whether a coat of linseed oil or something of that nature would not be preferable to a dry joint, Prof. Sweet said that it would not, for the reason that if the joint was ever taken apart the stuff would have to be scraped off, and the joint could not be made satisfactory again.

Mr. D. K. Nicholson's paper on "Rolling Steel Rails" was then read:

ROLLING STEEL RAILS.

In a three high mill a rail is made at one heat, and generally in 11 passes, from a bloom 7 in. square, or a little larger.

The first six passes are taken up in working the bloom from side to side into a billet, rudely, the shape of a rail. It is then ready for the finishing rolls. The seventh pass, or squabber, which is generally the first pass in the finishing train, is principally for forming the flanges of the rail (fig. 1). The billet goes through this pass with the head down and the flanges horizontal; the flanges are caught between the two rolls, and made thinner and wider according to the distance between the rolls forming the pass. So that this pass has almost absolute control of the flanges. The rail passes through the three succeeding passes with head and flanges vertical, without any change except uniform reduction and a gradual increase in the height. Then the rail goes

Continued on page 773.

RAILROAD GAZETTE

Published Every Friday,
At 73 Broadway, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood tha we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

In this issue appears the first of two articles on German compound locomotives as they are now built, the present designs being determined after a series of long-continued experiments in actual service. Among the illustrations accompanying these articles will be found indicator diagrams, 65 in number, from both the high and low-pressure cylinders at all points of cut off, varying, by tenths, from $\frac{2}{10}$ to full cut off. Also there are diagrams from the receivers and from the cylinders when the locomotive is driven backward. The results of actual service and the conclusions given are, we believe, the most reliable and satisfactory of those yet given for any compound, because of the care with which the experiments were conducted and the long periods over which the trials extended. But in any case the results represent the action of the simplest form of the compound locomotive, and they may be taken as representing the highest probable gain in economy in the use of steam to be obtained by compounding such engines. All the dimensions and results given have been translated to the American standards to facilitate comparisons.

The long discussion on the relative value of the contracting and the non-contracting chill which we published last week has little value further than to make the reader more familiar with the theory and operation of the contracting chill. If it does this it will be worth the space it takes up, for simple as the contracting chill is, it does not seem to be well understood by all the wheel makers, and still less by all the wheel users. It is important that they should understand it. We have no doubt that the contracting chill involves a correct principle, and that it will make better wheels than the non-contracting chill. Therefore, any discussion which brings it to the attention of those either making or consuming wheels has value. We said that the discussion had little other value. The tests reported appear to show some advantage for the contracting chill in the depth of the chill on the wheels relatively to the depth on the test pieces. That is, they appear to show that the contracting chill comes nearer to giving the maximum depth of chill than does the non-contracting. But what they did or did not seem to show is really of little consequence, for they were not numerous enough to prove anything. It is only by comparing average results from a large number of wheels that anything conclusive can be established. One wheel was poured in a common chill and three in a contracting chill under different conditions. The results were then brought forward to settle a complicated and hotly-disputed question. Of course they could settle nothing. As between the contracting chill using steam and water to aid the movement of the chill blocks, and the one in which this movement depends entirely upon the expansion of the metal, we can express no opinion. We have seen nowhere collected facts enough to prove that the use of steam and water is advantageous. The best information that we have is Mr. Barr's statement that he finds an average difference in favor of water of about 20 per cent., and he is one of the very few men in the country who have been able to make extended comparisons of the two processes side by side.

The Senate Investigating Committee has completed its examination of the Pacific roads and has returned home, full of assurance that these roads can pay their debt in full. With regard to the Union Pacific, such a result is, of course, possible, but we do not quite see how they make it out with regard to the Central Pacific also. Senator Frye is quoted as saying that if the Central Pacific could get coal as cheap as it is in the East, there would be no difficulty. That is probably true enough, but how they are to get their coal so cheap the Senator does not say. Can it be that he is going to agitate for a repeal of the duty on coal? He also says that the people along the line are the ones who must "eventually" pay the debts. It will be a pretty remote eventuality when the inhabitants of Vista, Wadsworth, Hot Springs, Mirage, White Plains, Brown's, Granite Point, Orenna, Rye Patch, Humboldt, Mill City and Rose Creek pay the debt on a hundred and fifty miles of road. Probably the Senators went through that part of the country in the night. Those who have seen it in the daylight will need no further comment. For the benefit of those who have not seen it, we may say that the debt-paying power of that country depends upon the value of sage-brush and horned toads as commercial products. Hitherto the supply of sage-brush has always been vastly in excess of the demand. Of course irrigation may change all these conditions, but we imagine that the railroad managers can irrigate their securities faster than the government will irrigate their lands.

When the President's agreement, which formed the basis of the Interstate Commerce Railway Association, was under discussion, the most important section was hurried through with little or no debate. This was the one which provides for division of traffic between competing roads, in case any of them should fail to get their share. The promoters of the agreement were afraid to say much. If they tried to prove that it was of any use they ran the risk of falling foul of the law against pools. They, therefore, accepted it in all its vagueness, hoping for a subsequent interpretation which should solve the difficulty. The first case under this clause has recently been decided by Chairman Walker. We publish his opinion in our traffic column. Like everything else which Mr. Walker publishes, it is truthful, forcible and well written. The only possible objection is that it is too long. We may condense it as follows:

1. We cannot find out how much traffic the Burlington ought to have.
2. If we could find out, we would rather not decide.
3. If we did decide, we could not enforce our decision.
4. If we could enforce our decision it would not meet the difficulty.

While we have no wish to criticise this opinion, we are reminded of an ancient French story. The King of France entered a town where he expected a royal salute, but none was given. Full of indignation, he called up the mayor of the town and asked why they did not fire a royal salute in his honor. "For twenty-three reasons," replied the mayor. "*First*, we had no cannon; *second*——" "You may omit the other twenty-two," said the king.

In speaking of the absorption of the Omaha Demurrage Bureau by the Chicago Car-Service Association, a month ago, we alluded to the possibility that this apparent step in the direction of economical management might prove to be a backward one, and to the fact that the saving of expense could not justly be made very great. We have just received a criticism of the way in which demurrage is being managed at Omaha which seems to justify our predictions. While this statement is *ex parte*, its points are such as appear reasonable in the nature of things. These are, in brief, that the detention charges are rigidly assessed, even where cars are not properly placed for unloading; that the checking clerk who takes the car numbers feels compelled to enter a charge for Smith's cars, even if he finds them on Brown's track; that charges are collected regardless of the weather, and the subsequent refunding of this charge is not prompt enough to satisfy the assignee. Moreover, the expense of the bureau is greater than before, though this fact is concealed by a transfer of work, some of which is now done by each freight agent individually, the cost of it, therefore not appearing on the rolls of the bureau. One large consignee refused a bill of $250, and smaller customers at once grew bold and took a similar stand. Making out demurrage bills on cars which the consignee cannot get at is sheer foolishness, and it cannot be that this is approved by the managements. It is a question whether charging for rainy days should not be a subject for compromise, at least in the beginning; but the general tone of this communication goes to prove the correctness of the principle which has been so successfully followed at a number of cities, of placing the whole of this business at a competitive point in the hands of *one person* of sufficient intelligence, and who is *on the ground*. The local freight agent, even if he be a much more capable business man than the commissioner, is handicapped not only by his relations to customers as a soliciting agent and by other details, but is very liable to be unconsciously warped by the very nature of his methods of doing business. The object of these collections being not the increase of revenue directly, but the release of cars, so that they may be earning legitimate revenue, the substantial success of the Omaha bureau would seem to be a complete justification of its methods. The attempt to make the rates for this service exactly equitable as between all interests can never be completely successful, any more than it is possible to make all freight rates strictly just, to a mill, as between every one of a thousand shippers. If no great injustice is done every one ought to feel satisfied. The Toledo Car Service Association begins business Dec. 1. The Cleveland Car Service Association is to be extended so as to include Akron, Kent, Mansfield and Galion. This association has accomplished one definite result already, as appears from a newspaper statement that the coal dealers have built a number of new sheds for the storage of coal which they have heretofore been allowed to keep on cars. We print in another column a summary of the results of the Denver Demurrage Bureau taken from the *Rocky Mountain News*.

Steam Action in Locomotive Cylinders at High Speeds.

An editorial in a recent issue of the *American Machinist*, entitled "Anything to Beat the Link," takes as a text an editorial paragraph which appeared in these columns Nov. 1, on the advantages and disadvantages of compression in locomotive cylinders. It is not very surprising that the editor of that journal should fall into errors when discussing locomotive practice, but we should expect him to be moderately familiar with the best theory and practice of steam engineering as applied to the stationary engine. In this instance he exhibits a strange want of knowledge of both branches of the subject.

Referring to the Stephenson link motion in general, the editor says:

> Periodically during the past 20 years some one has come to the front with arguments intended to demonstrate that the Stevenson [*sic*] link as used on locomotives is a wasteful device, and a relic of ignorance. The latest effort of this kind that we have noticed is that of an editorial writer in the *Railroad Gazette*.

It is hardly necessary to state our position on this matter, yet we may as well say at the outset that we consider the Stephenson the simplest, the cheapest and the easiest repaired of all forms of link motion that have yet been sufficiently used on American locomotives to demonstrate their value. It is true, however, that other valve gears have been offered which appear to have good features which the Stephenson motion does not possess. That peculiarity of its action which tends to increase the lead of the valve when the locomotive is traveling at high speeds is, perhaps, a fortunate one, and one that it would be difficult to get along without; but that feature which causes the exhaust valve to close earlier in the return stroke at short cut-offs than at long cut-offs is not so admirable or so advantageous, and the Stephenson link motion would be more satisfactory if the degree of compression could be regulated at will. But this is not within the possibilities of its construction.

One of our statements in the earlier editorial was,

> Third: The power used to compress steam in the clearance spaces is not wholly furnished by the expanding steam on the other side of the piston, but principally supplied from the stored energy in the moving parts of the machine, or by the power which the cylinder on the opposite side of the engine has generated. Therefore, the power used to compress steam in the clearance spaces is taken from that which has already been stored, with much loss due to friction and other causes, and hence it is an expensive power to use.

Of this our critic says "The third point raised is that the power used to compress the steam is principally furnished by the stored energy in the moving parts of the machine, and hence there is much loss from friction."

Comment on this is hardly necessary, as the critic misses the point entirely. We did not say that loss is occasioned during the period of compression by fric-

tion caused by compression, but that the power used to compress was taken from stored energy, which had been accumulated only after losses common to the steam engine, of which friction is one.

A surprising statement for a journal which lays much stress on its treatment of shop practice and stationary engine topics is the following, from the same column as the preceding:

It may be remarked, however, that the most remarkable examples of smooth and *cool* running high-speed engines are those in which high compression is employed; and cool running is the best evidence in the world of the absence of undue friction.

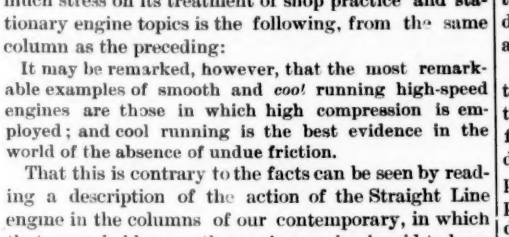
That this is contrary to the facts can be seen by reading a description of the action of the Straight Line engine in the columns of our contemporary, in which that remarkably smooth-running engine is said to have a constant compression rather small in amount and a variable lead, for the purpose of steadying the motion of the engine at varying cut-offs. This is not the only example of most satisfactory and smooth-running engines having small compression.

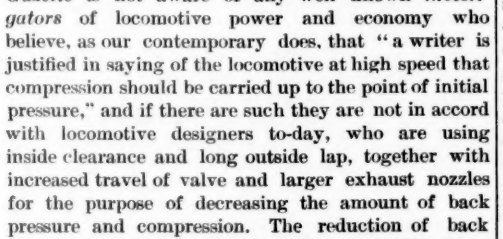
Another singular point in the criticism is the following: "In concluding this altogether remarkable article, the *Railroad Gazette* writer puts aside the opinions of some of the best known investigators of this subject in the country." The *Railroad Gazette* is not aware of any well known *investigators* of locomotive power and economy who believe, as our contemporary does, that "a writer is justified in saying of the locomotive at high speed that compression should be carried up to the point of initial pressure," and if there are such they are not in accord with locomotive designers to-day, who are using inside clearance and long outside lap, together with increased travel of valve and larger exhaust nozzles for the purpose of decreasing the amount of back pressure and compression. The reduction of back pressure by the large exhaust nozzles materially affects the amount of compression. Some railroad men have stated recently, and with a good show of reason, that a large amount of clearance in locomotives is advantageous, because it reduces the enormous compression difficult to remove with the Stepenson link motion. It is not necessary to quote recent foreign locomotives which are built from designs based on such principles.

Another statement is

Every one who knows anything about moving trains knows that large cylinders are required at starting, when compression is very small, and of no consequence in reducing the power, and that at high speeds and early cut-off, where compression reaches initial pressure, it would be an advantage if the cylinders were smaller. Here, then, high compression is advantageous, because it does in effect reduce the size of cylinders by reducing the quantity of steam used at a given pressure and ratio of expansion, thereby permitting a full throttle without ruinously early cut-off.

It is evident that the writer of that paragraph is unaware of the fact that locomotives need an increase in power at high speed. Nothing can be more satisfactory than facts. Here is an indicator card taken at 55 miles per hour from a locomotive—an actual card from a 10-wheel express locomotive. It is a representative card, such as would be taken from almost any high-speed American locomotive. It represents the maximum power and mean effective pressure attainable with the initial pressure used on the locomotive from which it was taken. If the cut-off be made longer, the back pressure is increased, and therefore the amount of compression also. If the cut-off be decreased, then, for obvious reasons, the mean effective pressure will be reduced. Now here is a more desirable form of card, and a comparison of it with the preceeding clearly indicates the point at issue—the relative amounts of compression. This card was taken at an almost identical speed, cut-off and steam pressure, and is therefore a comparative one in nearly all respects. It is not a hypothetical one, but an actual indicator card taken from a large express locomotive on the Lehigh Valley Railroad. The additional power with cards of the second type is easily seen, and who can, in the light of present knowledge of the science of locomotive engineering, say that the distribution of steam indicated by such cards is not as economical as that shown by the first type?





It is beyond dispute that our heavy express locomotives are lacking in power at high speeds, even while the majority of them have more than sufficient steam for the work being performed. What then shall be done to increase this power? The mean effective pressure cannot be increased with the same boiler pressure, except by a decrease in the compression, a decrease in the back pressure, or a superior admission of steam. The card given would be the same whether taken from a small or a large cylinder, and the mean effective pressure would be practically the same for either if the same general design of valve gear were used even if the ports were made in proportion to the capacity of the cylinder. If, now, the mean effective pressure is to remain constant, how is it possible that it would be of any advantage, as suggested by our contemporary, to reduce the area of the piston? Is it against *any* principle of steam engineering to assert that, with a given mean effective pressure and speed, a larger cylinder must be used to obtain an increase of power? If our contemporary had been aware of the practice of running high-speed locomotives at about 25 per cent. cut-off, and a full, or practically full, throttle opening, he would not have referred to such cut-offs as "ruinously early cut-offs," because 25 per cent. cannot be called an uneconomical cut-off.

With regard to the lack of economy from the reduction of compression in locomotives, we should like to know what and where are the records of locomotive performance that show more fuel used when the locomotives are equipped with devices which reduce compression? And what those devices are that are mentioned in the following from the same columns as the above quotations? "But it is equally well known that not a single device ever employed on the locomotive to reduce compression, as compared with the link, failed to call for more coal to do the same work."

So far this discussion has dealt with the economy of compressing steam to the initial pressure, and from that standpoint it is seen to be undesirable. There is another standpoint which is of quite as much consequence to the railroad man. It is that standpoint from which he views a locomotive in its capacity to haul heavy trains on time. If the reduction of compression in a locomotive cylinder will give to that locomotive more power and enable it to haul heavier trains according to schedule time, would it not be advisable and even desirable to sacrifice a little economy for a considerable increase in power?

If the author of the criticism had read the latest investigations into the matter of satisfactory valve motions for compound engines, he would have seen this matter fully and intelligently discussed by writers toward whom he might feel inclined to be just and polite.

The Question Box.

One of the chief obstacles in the way of perfect train service on railroads, as it is generally managed in this country, is the reluctance of the men to ask for enlightenment on matters which they have not been able to make fully clear to themselves. Every code of rules has a clause requiring all employés who are in doubt about the meaning of any rule to apply to the proper authority for explanation, but yet they do not apply. Lack of familiarity with rules on the part of intelligent, well-disposed men is constantly forced upon the attention of the superintendent, but when he tries to cure the evil he finds numerous difficulties in the way. Ignorance and pride go together, and those who most need information are the last to ask for it.

We have been led to the consideration of this question by observing the way it is treated by Mr. C. D. Hammond, Superintendent of the Delaware & Hudson Canal Co.'s road. He provides at various terminals where bulletin boards are located a "question box," where every man may ventilate his ignorance, no matter how profound it may be or how much he is ashamed of it. Whatever his questions, he can write them out, drop them in the box anonymously, and the superintendent will publish the solution on the house-tops. This seems to us an excellent idea. The question box has proved a very effectual means of drawing out information on knotty subjects in public conventions and elsewhere, and the anonymous correspondents' column in nearly every newspaper testifies to the wide recognition of the principles here involved and of the necessity of meeting this modesty engendered by ignorance.

Some means to encourage questions is especially necessary on railroads, for the reason that a conspicuous fault of railroad circulars is the absence of any explanation of the reasons for the things ordered or demanded. From the military traditions, which influenced railroad management in its early days, or from some other cause, the utmost brevity has become a fixed custom. Preambles and whereases, so familiar in political and other documents, are almost wholly unknown in railroad literature. How to get around this difficulty is not always clear. Even those superintendents who have most fully recognized the necessity of more thoroughly imparting instructions to their men have by no means satisfied themselves what is the best plan for carrying their purpose into effect. Simply enlarging the book of rules by explaining points more at length, and including several times as many of them as is generally done, is by no means satisfactory. Roads which have issued a number of square feet of fine-print rules on the back of their time-tables seem to have no better results than are found on roads with a much smaller code.

The question-and-answer form is one whose advantages should be more widely recognized. It has been found to be the only possible way of instructing children, and it is not far from the truth to say that it is the only certain method to be used with children of all ages. Who shall say that the success of Mr. Forney's Catechism of the Locomotive does not lie largely in this effective method of placing his topics fairly before the reader? A question box or its equivalent is necessary even where other means have been provided. A number of superintendents have questioned some of their trainmen and telegraph operators more or less fully, as our readers will recollect. This is good as far as it goes, but however successful the plan may have been as regards any one set of men, it has not yet been taken up with the requisite enthusiasm by any road to fully demonstrate its sufficiency as a system. Mr. Hammond's scheme does not by any means take the place of a regular examination according to a prescribed form, such as has been used on the Erie, the Fall Brook, the Chicago, Burlington & Quincy, the Chicago, Burlington & Northern and elsewhere. It should be regarded as an auxiliary to that. Where no examination has been attempted this serves to make a beginning, and in some case it is, perhaps, the only practicable beginning. Examining men according to a printed form, involving a large number of questions, sometimes encounters obstacles which only the most delicate tact will overcome. Men's diffidence is founded so largely on pride and is so strong that a direct attack upon their ignorance sometimes overdoes the thing. And the matter does not end with diffidence. A disinclination on the part of employés to be tested according to their real merits has been a material factor in strikes on more than one occasion. Every one is familiar with the frantic objections made by locomotive engineers to examinations for color blindness on several roads. The Burlington engineers in their strike a year and a half ago demanded relief from the catechiser and actually inserted a clause to this effect in their formal statement of grievances. Other roads have met with the same difficulty.

Men should not only be encouraged to ask questions; they must sooner or later be compelled to do it. Simply "leaving the door open for them to walk in"—as a well-known railroad president says is the practice at his office—is not enough. But with the proper effort and patience, this can be done without unduly wounding men's pride. As the railroads have put men in responsible places without proper investigation of their qualifications, it does not become the management to be too abrupt in ordering a radical elevation of the standard. The management itself is partly to blame for the deficiency, and so should bear a part of the burden of remedying it.

Steel in Locomotive Boilers.

Steel boilers for locomotives are not generally used in France, and when recently the Paris, Lyons & Mediterranean road decided to use higher pressures for compounding, one of the first matters to consider was the material and construction of a boiler to withstand such pressures. It was decided to use steel because of its greater strength, but there were some doubts of its reliability. In the light of our experience with steel boilers, these fears seem out of place; yet the steps taken to secure good steel show how carefully such matters are considered in France, and some American boiler makers could profit by the methods there used.

The specifications for the steel required a mininum strength of 59.735 lbs. per square inch, and a mini-

mum elongation of 26 per cent. in pieces 7.87 in. in length. It is noticeable that no maximum strength was specified, as is customary in the United States.

In working the steel, great precautions were taken to prevent injury to the metal. Punches were not allowed; all holes were drilled. All flanges were turned with hydraulic pressure, and work was stopped on the steel sheets when they were lowered in temperature to a dark red color. After flanging, and after being fitted and drilled ready for use, and even when rolled into form, the sheets were placed in a large annealing furnace, about 1,200 cu. ft. in capacity, constructed especially for the purpose, in which they were annealed, and after that the use on them of a hammer for any purpose, was carefully avoided. The holes were first drilled about 0.08 in. in diameter less than the diameter of the rivets, and after being put in place they were reamed to size. In annealing the sheets they were raised to a cherry red, and were kept at that temperature by a slow fire from 15 to 18 hours. At this time the cover of the furnace was slightly raised, the fire pulled out, and the temperature of the furnace and the sheets allowed to become reduced during the next 48 hours. The sheets were then removed from the furnace, and 12 hours after were put into position. Iron rivets were used, and driven preferably by hydraulic riveters.

This case of careful manipulation of steel sheets, with other instances of the kind which the traveling engineers saw this summer, go to show that the French, German and English engineer has not that high confidence in sheets of that material which is possessed by the engineer in the United States. If it were not for the large number of steel boilers in use here which run practically without cracking, or rupture of any sort, one might be somewhat concerned at the contrast between the scrupulous care taken by the foreign engineer and the more free and easy methods of boiler construction here. But the rarity of accidents to the vast number of steel locomotive boilers running in this country, often carelessly handled, is good evidence of the general reliability of our methods. It is true that we do punch steel boilers, but they seem to be none the worse for it. It is also true that the majority of all of the sheets in our boilers are unannealed, yet only a few of the vast number ever fail by cracking. It may be, however, that we have a better class of steel sheets to deal with, and that the large demand for steel of a low tensile strength and a maximum elongation has fostered the growth of and improvement of processes whereby we are able to obtain steel for the construction of boilers which has a uniformity in general characteristics that is almost unknown among boiler makers abroad.

Nevertheless, in spite of the good quality of steel which we are fortunate enough to possess, and the good fortune which seems to attend the construction of steel boilers—and their use as well—would it not be well to pay a little more attention to the matter of annealing steel sheets after they have been worked upon, particularly after they are flanged? Attempts are now being made to do this, and nearly all the modern locomotive specifications call for "All sheets to be annealed after flanging," but this is almost never done in the full sense of the term "annealed," or anything like it. It is no easy matter to anneal a steel sheet, and the mere heating over a wood fire for a short time, as the practice is in some localities here, not only does not properly anneal a sheet, but sometimes it is hardened by the sudden cooling allowed. There are many steel boilers now in use which are constructed of plates that have been flanged, but which are too large to enter any annealing furnace used for locomotive boiler work in this country. In some shops, however, steps are being taken to meet the demands of the regular specifications for locomotive boilers, notably at the Rhode Island Locomotive Works, where one of the largest annealing furnaces in the United States has been recently constructed, and is now in successful operation.

During the past week the amount subscribed to the guarantee fund for the World's Fair in New York has increased to $3,584,795, the subscriptions for the week being $358,946; and the enthusiastic journalists who were sure that the full amount of $5,000,000 would be obtained within ten days after the date of opening the subscription lists are now hoping that this event will not be prolonged beyond the time when Congress is to meet. In fact, signs of apathy are more abundant than evidences of enthusiasm. The total amount subscribed by the street railroad companies is only $120,000; by the hotels, $72,250, and the *World* publishes the names of 84 non-subscribing capitalists, adding: "Seven hundred millions for keeps, but not one cent for patriotism!" The Lager Beer Brewers' Board of Trade have done better, levying an assessment on every member of 10 cents for each barrel of beer sold during the year ending May 1, 1889, and they expect to raise $446,000 in this manner. The various committees, if they have been actively engaged, have been doing good by stealth, since they have made little public sign. At the recent meeting of the American Society of Mechanical Engineers, Mr. H. R. Towne, President of the Society, and an active member of the Committee on Site and Buildings for the World's Fair, announced that it is "a practical impossibility for New York, or any other city, within the 29 months remaining between the present and May 1, 1892, to make the necessary arrangements for a creditable international exposition," and urged the postponement of the proposed World's Fair until 1894.

The St. Louis agents for a World's Fair in that city passed through New York a few days ago on their way to Washington. When interviewed, they freely expatiated upon the advantages of St. Louis, laying special stress upon the following statistics, representing population and railroad mileage contained in circles 1,000 miles in diameter, having their centres respectively at New York, Chicago and St. Louis:

	Population. 1880.	Population. 1890.	Railroad mileage.
New York Circle	20,117,060	24,385,707	34,369
Chicago "	21,798,526	27,430,779	65,749
St. Louis "	23,833,011	30,584,905	77,571

Chicago, not content with capturing the United States and England, has sent agents to Paris, and the journals of that city are now discussing the question. According to the *Journal des Débats*, the struggle for the fair is between New York, the financial centre, and Chicago, "The Young Giant of the Great Lakes," the commercial centre. Chicago, it is added, is the typical city of the United States, and its choice is a matter of course.

Philadelphia papers report that the cut-off which the Pennsylvania proposes to build from Downingtown, 32 miles west of Philadelphia, direct to Trenton, N. J. passing through Norristown (18 miles northwest of Philadelphia) and affording a more direct line from the west to New York, is a certainty. They say it will be completed in 1892, and some of them are considerably worried at the prospect of seeing the New York and Chicago through trains pass by on the other side, as it were. It appears that the New York and Washington Congressional Limited already snubs Broad street, passengers to and from the South being carried in a special car, which is attached and detached at Gray's Ferry and hauled between there and Broad street by a special engine, while those to and from New York are required to take other trains. While it may be remarked in passing that Philadelphia ought to be thankful that she has as good accommodations as she now enjoys, seeing that Broad street is on a branch, there is no occasion for any special despondency. A city that covers all-out-doors cannot be made a way station with impunity, even if a railroad company desires it. Washington is "away off" from the direct line west, but the Baltimore & Ohio advertises its through trains as "all running via Washington." Albany and Rochester are not on the most direct route from New York to Buffalo, yet a large share of the through passengers seem to want to go that way. Moreover, a chief gain in building the new line will be the possibility of separating the freight from the passenger traffic, and it will be more profitable to run freight than passengers by the new route. The Pennsylvania already has the shortest route between New York and Chicago, so that it does not need cut out Philadelphia to keep up with its competitors in time, while in hauling heavy freight every mile saved is an advantage; and hogs and lumber, whether alive or dead, will utter no complaint at being deprived of the view of the 400 t. tower at Broad street.

Among the very numerous exhibits of the Prussian State Railroad Administration at the German Prevention of Accidents Exhibition, which has been held in Berlin the past summer, perhaps the most striking to an American are the appliances for preventing accidents in shops. Belts, cog-wheels, pulleys and other appliances for the transmission of motion are arranged or housed so as to make it as difficult as possible for the workman to be caught in them. On pulleys surfaces are made round and smooth, and all projections and angles are avoided, that they may not catch in clothes which happen to come in contact with them, belt fastenings, especially, being attended to. In many cases, wherever there is possibility of accident, provision is made for putting the machine, or the moving part from which danger is apprehended, out of gear from that spot. The necessity of coming too near moving parts in order to oil journals, etc., is avoided often by automatic lubricators, etc. There is also apparatus for protecting the openings of shop elevators, and brakes which prevent the sudden running down of loads on cranes and the consequent flying around of cranks, which has knocked down many a poor fellow. The appliances for instantaneously stopping the motion of steam engines are more numerous than any other one thing in the exhibition—mostly shown in models. Electric and other appliances are provided by which the workman from his machine can cut off steam on the distant engine; while others provide only for signaling to the engineman to stop. Cases of lint, bandages, etc., are provided in the shops (and on trains also), so that immediate relief may be given in case of accident, and the men are trained in their use. In many cases a man bleeds to death because help comes a few minutes too late. Drills, planes, lathes, etc., not only have the cog-wheels, etc., housed, but they are so arranged that they cannot be put into motion until the housings are in place. For metal lathes glass protectors are furnished, which prevent splinters flying into the workman's face, while they permit him to watch the work. In wood-working machines, metal plates cover the cutting parts not in use and circular saws, so that the workman cannot easily get his hands on them.

Somewhat the same set of causes which has led our railroads to use heavier rolling stock is leading to the construction of larger ocean steamers with more powerful engines. Just now the devolpments in water transportation are even more rapid than on land. It is little more than a year since the pioneer of twin-screw steamers in the Atlantic trade made its first voyage. Now there are five such boats in actual service, and more coming. The consort of the "Teutonic"—the "Majestic"—will be ready for service early next spring. Besides the "Augusta-Victoria" and the "Columbia," the Hamburg line has a third twin-screw boat, the "Normannia," well advanced, and a fourth under contract. As business designs, combining high speed with relative economy, the "Columbia" and "Augusta-Victoria" are probably the best boats on the water; and if the Hamburg Company can do as well with the next two, it will have the crack fleet of the Atlantic. Nor are other lines inactive. The Cunard people are not willing to leave the "City of Paris" in possession of the speed record, and are going to give us some boats within two years designed to be faster than anything now afloat. The Guion line is also occupied with new designs. The French line promises us "La Touraine" for next May; and if this is an improvement on "La Bretagne," it must be very good indeed. The Red Star Line has the "Friesland" now ready for use. Our Canadian neighbors have made arrangements for a service of 7,000-ton steamers from Vancouver to Japan, and seem likely to get a better Atlantic connection than they now have. The use of the twin-screw has not become by any means universal, nor is it likely to do so at once. Great successes in some cases have been balanced by decided failure in others. But the usefulness of the triple-expansion engine is a constant surprise even to those who believed in it from the outset. Few would have ventured to predict anything like the amount of success which has attended its introduction. It has directly and indirectly improved marine economy almost as much as the introduction of the steel rail improved the economy of transportation on land.

The Pennsylvania Railroad has lately asked permission to build a foot bridge over West street, New York, and it has been refused. This is another instance of a railroad being kept from adding to the safety and convenience of the public by municipal stupidity, or something worse. The general public suffers from the act of the local government, and then in its ignorance blames the railroad. The West street crossings to the various railroad ferries are so dangerous and so extremely disagreeable that it is a wonder that they have not long ago been bridged. The street is densely crowded with teams. The policemen at the crossings cannot keep them clear, and the great crowds who use the ferries morning and evening have to fight their way through with real danger to life and limb. The street is also one of the dirtiest in New York City, which is equivalent to saying that it it one of the dirtiest streets in the world. This fact has become clear this year to hundreds who never really believed it before. The engineers who went abroad this summer for the first time have brought home some new standards of comparison. The proposition of the Pennsylvania was one which involved a considerable expenditure of money, with little or no return. Certainly if the Erie, the Central of New Jersey and the Delaware, Lackawanna & Western followed suit (as they must have done in time) the Pennsylvania could have secured little additional patronage by adding to the convenience of getting to its New York station. The gain would have been almost entirely the public's. Probably the plan will not be dropped permanently, but it is a pity that the smoking flax should have been quenched.

A good run was made Nov. 16 by the Vanderbilt special train west on the Canada Southern line of the Michigan Central. The distance from St. Clair Junction, just west of St. Thomas, to Windsor is 107 miles. This was run in 97 minutes, including one stop of four minutes for water. The running time was 93 minutes, and the average speed 69.03 miles per hour. The highest speed recorded was 78 miles per hour for three miles between Ruscomb and Woodsloe. The four miles immediately preceeding were run at the rate of 75 miles per hour and the 26.5 miles from Buxton to Woodsloe at 73.1 miles per hour. The times were all taken by the standard clock in the St. Thomas office, the operator at each etation sending a signal as the train passed him. There was, therefore, little chance of error in the recorded times. The engine was a Schnectady locomotive, No. 416, and the runner was Andrew Nutzinger. The train was but two cars.

The increase of speed of the overland trains is wholly west of Council Bluffs. The Chicago & Northwestern runs one train out of Chicago at 10:30 p. m., as formerly. This arrives at Council Bluffs at 5:45 the following evening, where the first-class sleeping cars are attached to the limited fast mail and go out at 6:15, while second-class passengers and those for way stations start on the

overland express at 7:15. The mail leaves Chicago by the Burlington 4½ hours later than the above, making correspondingly faster time, and it is announced that this train is to hereafter carry passengers. The mail train runs from Council Bluffs to San Francisco in 65¼ hours, which is a trifle slower than the schedule of the Golden Gate special which ran last winter, being 30 miles an hour, including stops. The eastbound train is a little slower, taking 67 hours from San Francisco to Council Bluffs. Eastbound, the Chicago & Northwestern brings the fast transcontinental train on the same schedule with its Denver express and makes the time from Council Bluffs to Chicago in 14 hours, which is seven hours quicker than the overland express. The latter leaves Council Bluffs in the morning and the limited in the afternoon, both arriving in Chicago at 7 o'clock the next morning.

The Texas & Pacific is having a great deal of trouble in the courts over the location of its general offices, and is now in the situation of being between two fires. In 1885 the general offices were moved from Marshall to Dallas. The city of Marshall and the county in which it is located claimed an agreement by which the company was bound to stay in that city. The United States Court decided that the shops must not be moved, but the offices are still in Dallas pending a decision from the United States Supreme Court. In view of this unsettled state of things the road decided recently to move its offices back to Marshall; but now the owner of the building occupied at Dallas has got an injunction preventing this, claiming that $200,000 worth of his property would be impaired in value if the offices should be removed.

The evening of Nov. 18, a car on an express train on the Pennsylvania Railroad was derailed in the Pittsburgh yard, overturned and set on fire. The fire was extinguished before it had done much damage. It is well to say at once that the car was lighted by city gas. It is said that the fire was set by coals from an overturned stove. Whether or not the gas was ignited at the end of a broken pipe we have not been able to learn positively, although it is said to have been. The derailment was at a frog.

In an editorial in the *Engineer*, November 1, 1889, on the subject of engine bearings, the following appears; and while it may be true of English cars, it is rather a sarcasm when applied to our practice: "Railway axles seldom, if ever, give trouble by heating in the present day. That is because the bearing is taken on a comparatively narrow strip of metal the length of the journal. If dead fit brasses grasping the journal all round its circumference were used the result would be disastrous."

NEW PUBLICATIONS.

Thermodynamics, Heat Motors and Refrigerating Machines. By De Volson Wood, C. E., M. A., Professor of Engineering in Stevens' Institute of Technology. Third Edition: Revised and Enlarged. New York: John Wiley & Sons, 15 Astor place. 1889.

This volume, of 450 pages, contains so much detail that an enumeration of the contents alone would pass the reasonable limits of space allotted to a review, while, on the other hand, such mere enumeration would convey to the reader but little idea of the real merit and importance of the work. Suffice it to say that all the important propositions of the mechanical theory of heat are considered fully, both in analytical and graphical form, calculus being used freely, and nothing omitted which should be embraced within the scope of a treatise to be used as a text book on the subject in institutions of learning, or as a book of reference for the practicing engineer.

The special and distinguishing feature of this work, which, in our opinion, places it in the first rank as a text book on the subject, is the fact that the author presents numerous and well-selected examples every few pages for the application of the theoretical propositions, and that thus the pupil's grasp of what he has studied is tested and his horizon widened. These examples, too, are in many cases drawn from actual practice, and so the book is full of interesting practical problems and records of experimental investigations in the line of performance and efficiencies of engines, injectors, pumps, refrigerating machines and their accessories.

In other words, the science of thermodynamics is, in this work, placed in close association with the actual problems to which the engineer should apply his theoretical equipment in practice, a feature not attempted in any other work on the subject, and the lack of which is the cause of the existence of so much skepticism on the part of practicing engineers as to the value of the science itself. Of course we always except the great work of Rankine. But as Professor Wood puts it in his preface: "Rankine's giant-like processes are not adapted to the wants of the average student" (and the professor might have added "to the abilities" as well).

In the theoretical portion of the work Prof. Wood really, in the main, attempts to lead up to Rankine, and in so doing he does such admirable work, and gives so much of Rankine's own method in addition, that it really renders the study of Rankine unnecessary, except by those who delight to drink from the fountain source. The fact of Prof. Wood's applications embracing the most modern developments of engineering (as the copious extracts from, and references to, the most recent transactions of engineering societies and engineering periodicals show) gives his treatise a distinct advantage over all others.

The well-known lucidity of statement and method of the author, as a writer of text books, is again exemplified in this latest production. Prof. Wood, too, has added some original analyses and investigations of no small merit.

Our study has not been close enough to enable us to say that we indorse everything contained in the book but it does permit us to say that the student who has mastered the work (and the mastery is no specially difficult task) is sufficiently equipped and well trained to attack any practical problem of efficiency in engines in which thermodynamics play a part. He will not have attained a knowledge of mere formulæ, representing so much dead weight as far as the ability to put them to use in practice is concerned, but these formulæ will have become useful implements with which he can plow new fields and attack new problems.

We note that Prof. Wood decides on the figure 778 as the mechanical equivalent of the thermal unit (Joule's equivalent).

The American Railway; Its Construction, Development, Management and Appliances. New York. Charles Scribner's Sons. 1889. Pp. 456, with Index. Octavo, half leather. Price $6.

The well-known "railroad articles" which appeared in *Scribner's Magazine* within the last two years have been collected into a beautiful volume, with 225 illustrations and 32 maps and charts. The papers of which the volume is made up are by 14 different writers, each one especially well-informed on the subject which he handles. While the papers were written for a popular audience, and not with the end of instructing railroad men, the complete work contains much that is of interest and of permanent value even to them. There are gathered in it many historical and statistical facts which are difficult of access even to those who have pretty good railroad libraries, and it is a fairly good résumé of the construction, equipment, management and operation of American railroads. However incomplete it may be, and certainly one volume can cover so great a subject but very incompletely, it is the only work of its kind, and is reliable so far as it goes. No one of the writers could have pretended to exhaust the topic assigned to him in the space at his command. That was not within the scope of the work; but each one has treated his topic conscientiously and with knowledge and judgment. The result is a solid addition to the literature of railroads. The papers have been somewhat revised since they appeared in the magazine, and two new ones are added, an introduction by Judge Cooley, and a few selected statistics by Fletcher Hughes. The figures are chosen for purposes of popular illustration and make no pretentions to being complete or critical, but perhaps they will be all the more widely read on that account. Taking the book as whole, it is a credit to the enterprise and judgment of its publishers. We trust that it will have all the success which it deserves.

Railroad Laws of Wisconsin, 1878 to 1889. Compiled under the direction of Atley Peterson, Railroad Cammissioner.

The scope of this little volume is sufficiently indicated in its title. The index appears to be very full and will make the book valuable for reference. An appendix gives the schedules of tariff rates of the Chicago, Milwaukee & St. Paul in force June 15, 1872.

Report of the New York Produce Exchange for the Year Ending July 1, 1889.

This volume contains the usual detailed information of the organization, official reports and proceedings of the Produce Exchange, with the general trade rules regulating transactions in produce, grain, etc., on the Exchange. The customary statistical tables are published giving the comparative statistics of receipts, exports and imports at New York and other ports.

TRADE CATALOGUES.

Supplementary Catalalogue of the Gold Car heating Co., 1889-90.

This catalogue, which is dated November, 1889, is designed to show several improvements recently made by the Gold Company. This company fits cars for heating by the storage system, for heating by an auxiliary stove, or for steam heating by a plain pipe system. The company now uses one main supply pipe under the cars, which is shut by two traps, one at each end. To prevent dirt and foreign matter from getting into the traps and clogging them, what is called a sediment well, with separator, is attached. A deflecting plate in that well prevents condensed water from being blown through the coupling to the next car and causes dirt to fall to the bottom of the well, whence it can be readily blown out by using a plug at the bottom. A new illustration shows the method of attaching the interchangeable steam coupling to the main pipe in connection with the trap and sediment well, and also the arrangement of a dummy coupling for hanging the steam coupling when not in use.

Descriptive and Illustrated Catalogue of the Pratt & Whitney Co, Hartford, Conn. Edition of 1889.

This is a handy volume of 304 pages, containing excellent illustrations and short descriptions of an immense variety of tools. The book has a good index and thus becomes a really valuable book of reference.

The Tabor Indicator. Ashcroft Manufacturing Co., 111 Liberty street, New York.

This is a pamphlet of about 70 pages, 55 of which comprise a very good treatise on the Tabor indicator and its use. The method of making and of using indicator diagrams is given at considerable length, with illustrations and description of the apparatus, and a brief description of the Coffin planimeter and Amsler's polar planimeter, both of which are illustrated.

The Brown Hoisting & Conveying Machine Co., Cleveland, O., has issued a catalogue, describing hoists and conveyers. In connection with the description there are several fine cuts, some of which are made from photographs which illustrate plants already in operation. One of the largest is at Cleveland, at the Cleveland & Pittsburgh Railroad Co.'s docks. The Brown hoisting and conveying system is well described in this little pamphlet, and much information is given regarding such systems in general.

John Wiley & Sins, 15 Astor Place, New York, have issued a special catalogue, relating particularly to steam engines, boilers, locomotives and steam heating, etc. It comprises 40 pages and contains a brief description of each book in the special class for which it is issued.

The American Society of Mechanical Engineers

Continued from Page 769.

through the finishing pass, where the head is rounded (fig. 2), and from that it passes on to the saws to be cut.

Assuming that the passes have been properly turned out, it is the essential feature of the whole matter of rolling a rail to have them all exactly filled. If the bar does not fill out to any pass, more stuff is put in the pass; this is done by enlarging the preceding pass or passes by moving the rolls apart so as to bring out a bar of larger cross section. On the other hand, if the bar is of too great a cross section for the pass to roll out in length, the extra metal will squeeze out in the partings of the rolls, and either shear off or make a fin. The opposite course of treatment must then be resorted to.

Side guards are used to guide the bar to the pass, and to aid in keeping it from twisting or drawing to one side on leaving the pass. Side guards are sometimes called into play to put more metal into one side or the other of a piece by forcing it over, and compelling one side of the pass to rob the other. It is unnecessary to have a side-guard on each side of the pass when there is a greater amount of draught on one side of the bloom than on the other. The extra amount of draught on the one side throws the piece to the opposite side. There is then no need for a side guard on the side the bar has no tendency to touch.

The purpose of a guide is to keep the bar from following the roll on coming out of the pass, when for any reason it has a tendency to do so. The pass in the rolls is turned out so as to throw the piece against the guide to insure the bar being delivered safely from the rolls. Guides and side guards are then exactly as their names indicate, to "guide and guard" the bar in entering and leaving a pass in the rolls.

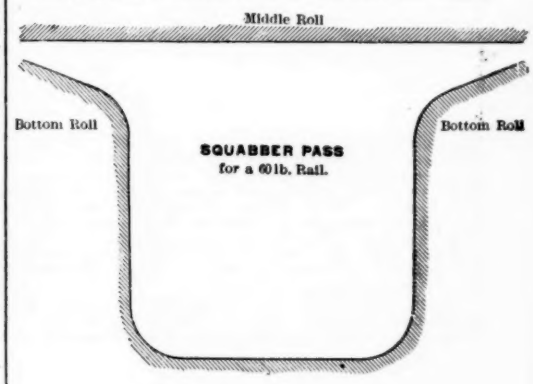


Fig. 1.

Finning and shearing comes from the metal squeezing between the partings of the rolls. It is the result, as stated above, of too much stuff going in the pass or part of the pass, or the bar not properly entering the pass. A small fin, or the indication of one, is the only positive evidence there is that the bar has filled out as intended. The wedge-like shape of the flange of a rail gives a considerable amount of end thrust to the rolls If this thrusting is not met by a force sufficient to overcome it the rail will be higher on one side than the other, and have a thick and thin flange (fig. 3).

Of all the troubles to be overcome in rolling a rail, the overfilling of the head in the finishing pass is probably the greatest. There is no real remedy for it except returning the rolls. Since the head of the rail is made somewhat rounding, the two rolls must be parted at the middle of the head in the finishing pass. When the metal runs out between the collars, it makes a fin, which is generally objected to more on account of its appearance than the harm it does (fig. 4). The cause may be looked for in the pass immediately preceding the finishing, the leading pass. When the rail has too much stuff under its head on each side of the web on coming out of this pass, on entering the finishing there is nothing to oppose this side work at the middle of the head where there is a space ¼ in. wide between the collars of the rolls. From this it is plain that the greater the angle under the head of the rail the more scope for the roll turner in the leading pass, and consequently the less liability to fin or overfill in the finishing pass. Rounding the collars with a file will sometimes make the overfilling less noticeable.

In speaking on the subject of the amount of draught that ought to be put on a piece of steel, no fixed rule can be given on account of the varying conditions under

which a piece is rolled. However, taking nearly everything into account, 10 to 20 per cent. has been found to cover nearly all cases, when the piece is turned to receive work on all its sides. In breaking down a piece of steel, light draught tends to make the sides concave; the work seems to be confined near the surfaces on which it is being rolled. Heavy draught will have the opposite effect. It follows, as would naturally be supposed, that in the same rolls the hotter the piece the more the tendency of the stuff to go out in the length; while the colder and harder the piece the more spread, and, consequently, the more the tendency to fin. More spread may then be looked for in high carbon steel than in low carbon or mild steel. It might be here remarked that in either case the shape into which the piece is to be rolled has a good deal to do with an imperfection in the steel

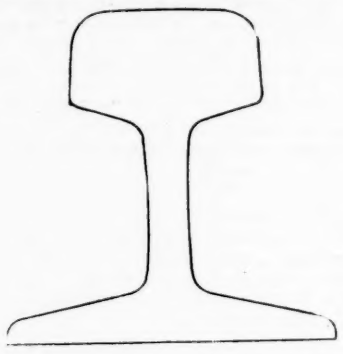


Fig. 2.

working out. For instance, a bad place in the part of the bloom falling to the head will work out, where it will not in the flange of a rail.

When a train of rolls is not strong enough, recourse can be had to three ways of making the rolls stronger: enlarging the diameter, shortening the body, and using better material in making the rolls. For every size bar there is a roll of a certain diameter that will make that

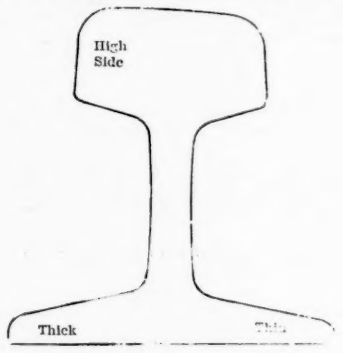


Fig. 3.

bar probably better than a roll of any other diameter. Of course such a thing as having different size rolls for every section of rails would not be practicable. So a train is selected with respect to the average work that is to be done. Rolls of small diameter are more likely to work the flaws out of a piece of steel than rolls of a large diameter. There is very little spring in a roll with a short body. For these reasons alone it appears that the second of the above-mentioned schemes (to shorten the body) would be the one to adopt.

The great drawback to a cast-steel roll is the fact that the surface cracks so badly. They do very well for roughing or where enough passes follow to smooth the

Fig. 4.

bar. A forged steel roll cracks very much less than a cast roll, but the cost puts it out of the question. As for strength, they may be said to be everlasting. This puts somewhat of a limit on the material used for a finishing roll after going outside of the best mixture of cast iron.

In a three high mill the passes in the top and middle rolls can be altered without disturbing the passes in the middle and bottom rolls. A two high mill has the advantage in handling the bar, since it enters all the passes of the rolls on the same plane. And it is only necessary to have two rolls instead of three. But then in altering a pass, shifting one roll affects all the passes except where the finishing pass is in separate housings, which is a good thing in either train. The great speed at which the rolls are run after the bar has entered the pass in a two high reversing mill often goes against the proper formation of the rail.

In going above two lengths it is very necessary to take every precaution in putting down a mill. The long-continued strain in a set of rolls when 120 ft. of rail go through is trying in the extreme on the rolls, especially as regards the end thrust. It is only by having several set screws and a well babbited surface on the lip of the brass that the rolls can be held in their proper place in single lengths. In four lengths this would probably be double, and possibly more. Of course, all this is not insurmountable if all the parts are made strong enough to resist the strain put on them, and the train kept in line—that is, the engine shaft, the pinion and roll to which it is coupled, having their axes in one stralght line, and the axes of all the rolls in the same vertical plane; for besides the train pulling hard, when the rolls are not in the same plane, the piece is liable to come out twisted.

In the discussion which followed Mr. Hunt, of Chicago, said that railroad engineers were the principal objectors to overfilling. He believed that a slight sign of overfilling was desirable as showing plenty of work on the last rolls. The mills were held down by purchasers to the production of a smooth surface. A satisfactory steel roll has not yet been made. A semi-steel roll made by Johnson, of Spuyten Duyvil, was very good, but expensive, costing about 2½ times as much as cast iron. The product of rails was now so large, however, that the cost of rolls per ton of output was a small matter. In October the mill with which he was connected had manufactured 28,491 tons of rails from one train of rolls, being at the rate of one 30-foot rail every 15 seconds, which brought the cost of rolls down to an average of five cents per ton. In reply to an inquiry regarding the Johnson rolls, Mr. Hunt stated that they were made in an open-hearth furnace, and contained ferro-manganese, and about 0.2 per cent. carbon. They were harder than cast iron, and had the ductility of commercial steel. He called attention to the importance of temperatures in the rolling of steel, and said that the overheating of steel in order to make it easy for the rolls had resulted in the delivery of some very poor rails. Rolls of small diameter were easier in steel than the large rolls. The turning of rolls had now been brought down to a mathematical formula, so that the mechanic was no longer dependent on the rule of thumb.

The paper of Mr. C. J. H. Woodbury, on "Methods of Reducing the Fire Loss," elicited an animated discussion, many members having had experience with fire losses.

Mr. McBride referring to the organization of employés, and their instruction in fire drill, cited a case in Brooklyn where a manufacturer took special pride in the efficiency of his private fire department, and frequently called them out by a false alarm in order that visitors might observe their thorough discipline. In spite of these precautions the factory took fire and was totally consumed, and since that time more reliance had been placed on the city department, and the new establishment had been fitted up with all known precautionary devices against fire loss.

Prof. Sweet called attention to the importance of a liberal water supply, and mentioned a case where a fire had been brought under control by an automatic sprinkler, but when the fire engine arrived it drew all the water from the pipes and permitted the fire to regain headway.

President Towne thought that there might be too much water, as in the case of an oil fire at his establishment in Stamford, where the flames were spread by the burning oil being carried by the water. Since that experience they had built a pit lined with brick in the centre of their oil and paint storehouse of sufficient capacity to hold all of that inflammable material contained in the building. Another member stated that at the Wheeler & Wilson factory, at Bridgeport, Conn., chimneys had been built inclosing the japan tanks, with a cover to keep out the rain, and a door at the bottom which was closed at night. This door, when open during the day, was supported by a string in such a manner that it would close automatically when the string was burned off, while a similar arrangement raised the cover on top of the chimney.

The first day's session then closed. A subscription dinner arranged by the local committee took place in the evening, at which about 300 members and guests were present.

Wednesday, Nov. 20, was devoted to an excursion to Willets Point by the steamer Laura M. Starin, where the government work in charge of Lieutenant-Colonel W. R. King was inspected. On the return trip the members visited the Central Forge Works, at Whitestone, L. I.

TECHNICAL.

Locomotive Building.

The Kansas City, Memphis & Birmingham has received two passenger and four freight locomotives from the Rhode Island Locomotive Works.

The New York Central & Hudson River has received ten mogul freight locomotives from the Schenectady Locomotive Works and the New York Locomotive Works,

The St. Louis, Vandalia & Terre Haute is understood to be in the market for five passenger engines.

The Schenectady Locomotive Works are building ten engines for the Chesapeake & Ohio for use on the mountain division of that road.

The Canadian Locomotive & Engine Co., of Kingston, Ont., is now working on orders for 15 locomotives for various roads.

The New York Locomotive Works, of Rome, N. Y., shipped last week four passenger locomotives to the Rio Grande Western.

H. K. Porter & Co., of Pittsburgh, have completed a narrow-gauge shifting engine to be used in the United States Navy Yard at Washington.

The Georgia Pacific received nine freight locomotives from the Rogers Locomotive Works, Paterson, N. J., last week. During the past month the road has received 16 engines.

Car Notes.

The Lafayette Car Works have completed the last lot of 200 box cars ordered by the Lake Erie & Western. The company is now at work on 500 cars for the Lake Shore & Michigan Southern.

The contract for building 500 box cars for the Louisville, New Albany & Chicago will be let in a few days.

The Terre Haute Car & Mfg. Co. has been awarded a contract to build 100 stock cars for the Cleveland, Cincinnati, Chicago & St. Louis. This is in addition to the 100 cars ordered by this road last month.

The 1,000 freight cars recently ordered by the Central of Georgia are to be built by the Ohio Falls Car Co., of Jeffersonville, Ind. Four hundred will be box cars, a similar number platform, and 200 will be coal cars.

Five hundred box cars are being built by the Lima Car Co., of Lima, O., for the Pennsylvania.

The Barney & Smith Mfg. Co., of Dayton, O., is building 100 coal cars for the Kansas City, Memphis & Birmingham. The road has just received 200 coal cars.

The Mount Clare shops of the Baltimore & Ohio have completed the cars for two of the four vestibule trains which are to be run between Baltimore and Chicago.

The Wabash has leased 350 freight cars from the Haskell & Barker Car Co., of Michigan City, Ind., and has also ordered a number of new stock and box cars of 40,000 and 60,000 lbs. capacity.

The Union Pacific has divided the contract for building 140 box cars, 23 stock, six furniture and nine fruit cars with the Peninsular Car Co. and the Michigan Car Co., of Detroit, Mich. The latter company also has a contract for building 30 platform and 100 coal cars.

The Covington & Macon has received the first lot of 10 freight cars of an order for 50 which it has under contract.

The Burton stock cars are now manufactured under Canadian patents at the car works of James Crossen, Coburg, Ont.

The Terre Haute Car & Mfg. Co. has been awarded a contract for building 200 cars for the American Refrigerator Car Co. It is stated that the company will soon let a contract for building a large number of cars.

The Kingston & Pembroke is building a number of new first-class passenger cars at its shops at Kingston, Ont.

The Pullman Car Co. has just built four sleeping cars with four drawing rooms each. Two of these, the Sydenham and Nantasket, are used by the Raymond & Whitcomb Excursion Co. Two drawing rooms are placed at each end of the car, and there are six ordinary sections in the centre.

Bridge Notes.

The Mount Vernon Bridge Co. has been awarded the contract for building the Burr street bridge at St. Paul, Minn., for $6,092.

The Groton Bridge Works, of Groton, N. Y., are building an iron bridge across the Cattaraugus River, at Gowanda, N. Y. It has a span of 153 ft., and will cost $11,000.

The New York, Lake Erie & Western is building a double track iron bridge over the Delaware River, at Hancock, N. Y.

The Union Pacific has commenced work on the new iron bridge at Twentieth street, Omaha. The bridge, when completed, will cost $44,000.

An iron bridge is to be built over Deer Creek by the trustees of Nevada City, Nev.

The contract to build the bridge over the Vermilion River, at Danville, Ind., has been let to the Lafayette Bridge Co., at $15,000.

An appropriation of $15,000 has been voted to build an iron bridge over the Cumberland River at Barbourville, Knox County, Ky.

The County Commissioners have been asked to build an iron bridge at the foot of Sixth street, Reading, Pa., but they have as yet taken no action on the petition.

The St. Louis Bridge Co. has been awarded contracts for building small iron bridges over Post Creek and Six-Mile Creek, near Topeka, Kan.

The Indianapolis & Vincennes has just completed an iron bridge over Eel River and two over White River. The bridge at Gosport, Ind., is also nearly completed. The latter has three spans of 140 ft. each.

The Milwaukee Bridge Co. has been let a contract for building a bridge at Boscobel, Wis.

The Santa Anna & Newport has prepared plans for an iron bridge across the Santa Anna River, near Los Angeles, Cal.

A company has been organized to construct a bridge across Cane River, at Natchitoches, La.

Bids will be received until Nov. 26 for building lift bridges over the Erie Canal at Lyons, N. Y., and at Rochester. The Superintendent of Public Works at Albany, N. Y., will let the contracts.

An iron highway bridge is to be erected at Glens Falls, N. Y., and bids for building it have been asked by the Highway Commissioners.

The Sioux City Pontoon Bridge Co. has been organized to build a railroad and wagon bridge across the Missouri River at Sioux City, Ia. The bridge will be about 2,280 ft. long.

The chief of engineers has appointed a board of engineers to report on the proposed bridge across the Mississippi River below New Orleans.

The Keystone Bridge Co. has filed suit in the United States Circuit Court in New York against the Louisville, St. Louis & Texas, to recover $17,015, a balance alleged to be due on the construction of the Doe Run and Green River bridges.

The Grand Trunk is strengthening and rebuilding several bridges on its road in Ontario, over Sixteen-Mile and Twelve-Mile creeks.

The Dominion government has decided that there must be a draw of 100 ft. in the bridge which the Canadian Pacific proposes to build over the Fraser River, near Mission, B. C. The company had contended that only an 80-ft. draw was needed, but the residents of New Westminster objected to this and asked that the company be made to build a 100-ft. draw.

The surveys and soundings for the proposed Navy Island bridge at St. John, N. B., have been completed and show no great engineering difficulty, as was feared. The surveys show a depth of water of from 125 to 165 ft.

Robinson & Girvins have the contracts for the iron bridges and trestles on 100 miles of the Morris & Brandon branch of the Northern Pacific & Manitoba. Over 100 structures will be built, including seven large trestles and three double-deck bridges. About 35,000 ft. of piling and 1,000,000 ft. of timber will be used.

The New Brunswick road is building a new iron bridge over the Monquart River, with piers and abutments of granite masonry.

The Variety Iron Works, of Cleveland, O., has been awarded the contract for an iron bridge with a span of 140 ft., at St. Clairsville, O., for $3,080. There were 15 bids received.

The following bids were received by the County Commissioners for building a bridge over the Chattahoochie at Atlanta, Ga.: Atlanta Bridge & Axle Works, Atlanta, Ga., $13,350; Groton Bridge Co., of Groton, N. Y., $14,620; Milwaukee Bridge & Iron Works, $17,378; Milliken Brothers, New York, $28,758; Southern Bridge Co., of Birmingham, $15,200; Champion Bridge Co., of Wilmington, O., $15,975; King Iron Bridge Co., of Cleveland, O., $13,990; George H. Crafts, Atlanta, Ga., $13,554;

Youngstown Bridge Co., of Youngstown, O., $14,500; Moore & Bullen, of Decatur, Ala., $14,625; Columbus Bridge Co., Columbus, O., $14,010; A. V. Gude, Atlanta, Ga., $24,000; Massillon Bridge Co., Massillon, O., $14,300; W. H. Converse, Chattanooga, $13,770; Pittsburgh Bridge Co., Pittsburgh, $15,000.

Manufacturing and Business.

The Kansas City, Fort Scott & Memphis has decided to fit up its passenger cars with the Frost dry carburetter system of lighting.

The Rowe Feed Water Heater Co. has been incorporated in Illinois with a capital stock of $75,000, by A. N. Eastman, A. W. Bulkeley and others.

The Scarritt Furniture Co., of St. Louis, has fitted up six cars for the Chesapeake & Ohio with the Scarritt reclining chair. Two cars are being fitted for the Pennsylvania lines west of Pittsburgh and two for the Chicago & Alton. The company has fitted a number of cars with chairs for export to South American countries.

The Heisler Electric Light Co., of St. Louis, has installed an electric plant in the works of the Lafayette Car Co., at Lafayette, Ind.

The Water-Works Committee, of Ottawa, Ont., last week opened tenders for the supply of 6,300 ft. of 40-in. steel pipe, 56 flange joints and 70 flexible joints. Nine tenders were received as follows: Law Bros. & Co., Ottawa, 547,558; Kingston Locomotive Works, $51,275; W. H. Law, Peterboro, $52,178; N. S. Blaisdell & Co., Ottawa, $53,235; Brousseau & Mather, Montreal, $55,615; Perkins & Stewart, Ottawa, $59,598; Weir, White & McDougall, Montreal, $59,850; John A. Bell, Toronto, $63,209; T. Turnbull & Co., Montreal, $64,295. The contract was awarded to Law Bros. & Co., who made the lowest tender.

The Miramichi Foundry, at Miramichi, N. B., has contracted to build compound engines of 150 H. P., and boiler, for a large tug-boat, to be built this winter at Vancouver, B. C., for C. C. Murray. The foundry is also preparing tenders for the building of two sets of triple expansion engines for parties on the Pacific Coast.

Tenders have been invited by the city of Victoria, B. C., for the construction and laying of a steel water main, 24 in. in diameter and about 6,000 ft. in length, from the dam of the Victoria water-works toward the city.

There has lately been on exhibition in the Chicago, Rock Island & Pacific Station in Chicago one of the Burton Stock Car Co.'s stock cars fitted with the Caswell interchangeable car coupler. Mr. Caswell is one of the mechanical men in the employ of the Burton Stock Car Co., and this invention has been made by him to obviate the difficulties and loss of time during a change from Miller to Hinson couplers when their cars are changed from passenger to freight trains. With the new device it is only necessary to rotate the large malleable iron casting, which contains both styles of couplers, through an angle of 90 degrees. When the combined coupler acts as a Miller, it has all of the functions of the ordinary Miller hook.

Among orders taken by the Industrial Works of Bay City, Mich., during the past week, have been two for 35-ton wrecking and construction cranes of new design, and similar to one recently built for the Kansas City, Fort Scott & Memphis road. These cranes are for the Michigan Central and the Rio Grande Western. Orders have also been received for two steel 15-ton transfer cranes for the Pennsylvania, and for a traveling crane for the Jackson shops of the Michigan Central. The capacity of the works is being increased by the addition of new machinery in several departments.

Iron and Steel.

The foundry portion of the foundry and machine-shop of the Allentown Iron Co., at Allentown, Pa., has been leased by the Allentown Foundry & Machine Co.

The Sharon Steel Casting Co., of Sharon, Pa., has just completed the erection of a machine shop and put it in operation. It measures 80 by 80 ft. The plant is being operated to its utmost capacity.

Wm. Fisher, of Pittsburgh, has shipped a 16-ton roll-turning lathe to the Illinois Steel Co. The lathe is about 20 ft. long and will swing a roll 13 ft. long by 40 in. in diameter.

The new machine shops of the Iron Bay Mfg. Co., at Duluth, Minn., are approaching completion. The plant at Marquette is being prepared for the removal of its machinery to Duluth. A 14x30 Corliss engine has been built at Marquette for use in the Duluth shops.

The interest of J. G. Beale in the firm of Jennings, Beale & Co., Limited, having been purchased by his partners, a new firm has been organized under the firm name of Jennings Bros. & Co., Limited, who will continue the business of manufacturing fine grades of Siemens-Martin open-hearth sheet steel.

The Schlesinger syndicate is understood to have purchased the Buffalo, South Buffalo, Queen, and Prince of Wales Mines near Negaunee for prices aggregating about $800,000. The mines are in the Marquette region.

Advertisements have been issued from the Navy Department for proposals for furnishing steel plates for use in the construction of the United States armored battle ship "Texas," building at the Norfolk Navy Yard, to be opened Dec. 16. About 660 tons of plates are required, of which 246 tons are for the lower layer of protective deck plating and 415 tons for the upper and middle layers, the upper and lower layers of top of redoubt and the protective side plating.

Cartwright, McCurdy & Co., of Youngstown, O., are increasing the capacity of their rolling mill by erecting eight new puddling furnaces.

The Swindell & Smythe Co., of Pittsburgh, have received a contract from the Ætna Iron & Steel Co., of Bridgeport, O., for erecting a Siemens gas-producer, being the third one they have erected for the firm.

The Crescent Steel Co., of Pittsburgh, proposes to erect an 18-in. mill. A Bessemer steel plant has been recently completed by the firm.

The stockholders of the Henderson Steel Co. have voted to issue $50,000 in bonds to provide funds for building the proposed new furnace and other improvements.

The Baltimore & Ohio proposes to lease its rolling mill property at Cumberland, Md., to outside parties. When the company operated the mill it was seldom used to its full capacity, but it is believed that it will be under the new arrangement.

The Secretary of the Navy has issued an advertisement for proposals for building the proposed new steel gunboats, Nos. 5 and 6, of about 1,000 tons each, and for a steel practice vessel of about 800 tons for the Annapolis Naval Academy, the proposals to be opened Jan. 22, 1890. The cost of the gunboats (exclusive of speed premium) is limited to $350,000 each, and that of the practice ship to $360,000.

The Rail Market.

Steel Rails.—The market is very unsettled, and great diversity of opinion prevails as to the outlook for business. Sellers generally will not give quotations, but $35 is quoted by some, and it is said as low as $32 has been quoted. But these are extremes, and it is believed that those mills quoting $35 do not wish to take any contracts. Some consider $33@$34 a fair quotation. A lot of 5,000 tons was sold in the New York market for $35, but it is understood that the buyer was a speculator. Chicago reports few inquiries and sales of only small lots. Quotations are $35 for next year's business and $37@$37.50 for prompt delivery of small lots. Pittsburgh mills are busy and quote $35 for short delivery, but this is known to have been shaded.

Old Rails.—The market is quiet, with few sales. A lot of American tees have been sold in New York for $24.25. Old iron rails are quoted at $20 at Pittsburgh, but few sales have been made, and the same is true of old steel rails, which are quoted at $22 for short pieces. Chicago quotes $26@$26.25 for old iron rails, and $19.50@$20 for old steel rails, which are in demand.

Track Fastenings.—At Pittsburgh spikes are quoted at $2.15, 30 days, delivered on cars in Pittsburgh, and $2.25 delivered in the West.

Shop Notes.

The Aurora shops of the Chicago, Burlington & Quincy are crowded with work. They have recently turned out a new design of locomotive with a peculiar fire box which is most interesting in its construction. This locomotive is a modification of the class "A" and is now being tried on the Fox River branch. It has a large fire-box volume in proportion to its grate and to gain this the tubes have been shortened. When this locomotive has been well tried and its value determined the results will be made public.

In the shops at Aurora is building a table with chucks and clamps to be attached to the cold metal saw, which has been in use for some time past. This table can be moved by screws in two directions, like a slide rest on a lathe, and it is expected that by its use the capacity of the cold saw will be much increased and that new classes of work can be performed therewith. In the draughting office the draughtsmen are full of work, and among the new designs, recently turned out and in progress, are a new furniture car, draft gear, brake gear for freight trucks, a traveling crane, etc.

The Comforts of a Great Station.

If President Chauncey Depew will go into the passenger waiting room of the New York Central in this town some day, say at the time people gather there to take the 10:30 a. m. train north, and will buy a ticket just as common folks do, and will take his place with the herd while they wait for the doors to open, carrying a heavy gripsack meanwhile, it is reasonable to suppose that he will observe a growing burden on the people who patronize his trains, and will take prompt steps to abate it. There are but two exits from the great room, and passengers must file out and show tickets, as they go. For 20 minutes, at least, before each train leaves the depot the pressure of people standing about these exits is dangerous to health, not to mention the lesser misery which kind-hearted people suffer through witnessing the needless misery of mothers with small children. Mr. Depew knows very well that it is uselees to say they could sit down on the other side of the room if they wanted to do so. Besides, the people commonly outnumber the seats. Mr. Depew might compare the Utica waiting room with that in this city, with advantage to New Yorkers. In Utica the people buy and show their tickets in a lobby, from which they pass to the waiting room The waiting-room has seven exits through which people pass comfortably when the train is announced. If one end or one side of the Grand Central depot were fenced off for a lobby wherein people could buy their tickets, and then pass through the fence to the waiting room, and if three or four double doors were cut from the waiting room to the platform, the serious struggle that takes place daily about the exits of the Hudson River Railroad depot in this town would be averted.—*The Sun.*

It is not alone the patrons of the Grand Central station who have their annoyances. Those who leave the city by the roads which have their termini along the Hudson River have to cross West street. The crossings are always filthy and the street is generally crowded with teams, so that the passage is always disagreeable and often actually dangerous. Arrived at the New Jersey side the great stream of travel has to pour through the waiting rooms of the stations and squeeze through crowded doors to get to the train house. As by far the greater number of the passengers hold season tickets, one would suppose that they might be spared the daily annoyance of going through waiting rooms and two or three sets of doors, and be allowed to pass directly from the ferry-boats to the cars.

Another Chicago Tunnel.

President Charles T. Yerkes, of the West Chicago Street Railroad Tunnel Co., requests sealed proposals for the construction of a tunnel under the Chicago River. The tunnel will commence at the west line of Franklin street and extend to the east line of Clinton street, a distance of about 1,513 ft., and will be 30 ft. wide in the clear and 15 ft. 9 in. high above rail level. Commencing at Franklin street there will be an open approach about 277 ft. long, of which 96 ft. is under a seven-story and basement brick building, at which point the tunnel proper will commence, continuing about 48 ft. further under the same building, thence westward under Market street and under a seven-story and basement brick building, thence under the Chicago River, where the lowest point of track level will be about 52 ft. below street grade. From this point westward under the river and under the railroad tracks near the Union Depot, under Canal street, and under a five and a three story and basement brick building to the east line of Clinton street. The contractor will be required to underpin the foundation and be responsible for the safety of all buildings on the line of and adjacent to the line of the tunnel. He must not interfere with the legitimate use of the railroad and must not interfere with traffic on the public streets during the construction of this work.

The total cost of the tunnel will be about $500,000. This tunnel will be for the use of cars running south of Madison street, and will be the basis of another loop on the south embracing Franklin, Van Buren, Dearborn and Adams streets, which will tend to relieve the traffic over the bridges. All the property required as a preliminary to the construction and use of the tunnel has been acquired for some time past.

A Patent on Rolling Beams.

A United States patent on rolling flanged beams has been granted to J. Kennedy, Latrobe, and H. Aiken, Homestead, Pa. The improvement consists in forming such beams by reduction of metal blooms, and rolling such beams—at different passes between rolls—on the sides of the flanges and on the edges of the flanges for the purpose of finishing the same; also in finishing such beams by means of rolls whose partings produce a fin on the outer sides of the flanges, the improvement which consists in producing, prior to such finishing, grooves or depressions on said flanges on lines coincident with the lines of said fins.

Webb's Improved Fire Box.

The following patent on improvements in locomotive boilers has been granted to Mr. F. W. Webb, Mechanical Superintendent of the London & Northwestern Railway. The invention relates to the construction of the fire-box, and its combination and arrangement with the shell and flue tubes of the boiler. The front plate at the fire-box end is bent at its edge to fit the shell, so that both heads of the rivets securing the plate and shell together are at the outside, and can be readily riveted up or removed when the fire box is in position. The top, sides, and two ends of the fire-box plates may be corrugated and the bottom left plain if desired. Ordinary beam stays are employed. There are the usual screw stays between the fire box and its inclosing shell. Part of the fire box enters the barrel part of the boiler. According to another modification, the fire box is formed by two cylinders arranged one over the other with a space between them, but a part of the cylinders in front of the fire box are not entire circles, as the bottom of the upper and top of the lower one are absent, and the sides of the two partial cylinders are united by flat or curved plates, and through this space the fuel can be placed on the grate bars in the lower cylinder, and the hot gases can ascend from the furnace in the lower cylinder to the upper cylinder, and pass along it and through the combustion chamber to the flue tubes.

An Electric Reading Lamp.

One of the most attractive novelties in the equipment of parlor cars is the Gibbs' reading lamp in use on six Pullman cars running west from Chicago on the Chicago, Milwaukee & St. Paul. One incandescent lamp placed in the partition between the seats furnishes light for two sections, and six lamps thus located supply the whole car with light specially for reading, and so directed and shaded that it is thrown directly upon a book or paper in the hands of the passenger, and it does not, by its glare, inconvenience others who do not desire to read.

Electric Headlights.

Electric headlights have been in use for a number of months on the Indianapolis, Decatur & Western, and it is now announced that a company has been organized at Indianapolis, to be known as the National Electric Locomotive Headlight Co., which is to manufacture headlights on an extensive scale. R. B. F. Pierce, General Solicitor of the above-named road, is President and General Manager of the company, which is said to have ample capital.

An Elevated Road for Jersey City.

The Central Elevated Transit Co. has made application to the Jersey City Board of Aldermen for permission to build an elevated railroad. The line is to extend from the ferry of the Central Railroad of New Jersey at Communipaw directly west to West Side avenue, on the Bergen hillside. It is said that right of way has already been secured except on a section of Jewett avenue. Eight local stations are to be put up on the 2½-mile stretch. It is expected that the road will rapidly build up one of the most beautiful of the residence sections in New Jersey. A million dollars of capital has been subscribed. President A. C. Cheney, of the Garfield National Bank in New York, is President of the company. The other incorporators are Hiram Hitchcock, A. B. Darling, Stephen O. Jennings, R. T. Harvey, Charles L. Crary, Garret Van Horne, William G. Bumsted, Edlow W. Harrison, John Hilton, George Holmes, J. P. Ryan and James Raymond.

A Heavy Bellite Blast.

In connection with the Westport Harbor Works, New Zealand, a granite quarry is being worked at Cape Foulwind by the contractors, Messrs. Wilkie Brothers & Wilson. It became necessary to dislodge a mass of stone weighing some 1,800 tons. The position of the mass was favorable, the rock being loose on three sides. To effect the blast, a tunnel was driven 15 ft. into the stone, and a chamber 10 ft. long was formed at the end, the whole forming a T in plan. The weight of dynamite which would have been necessary to do the work required is stated by the Government Engineer of Public Works, whose report is before us, to have been 200 lbs., and accordingly a 200-lb. charge of bellite was employed. This charge was divided into two charges of 125 lbs. and 75 lbs. respectively, and placed in either end of the chamber. The result of the blast was most satisfactory. The shot not only broke up the whole of the rock, which it was desired to bring down, into convenient pieces ranging from three tons to 20 tons in weight, but it worked back, dislodging altogether about 2,200 tons, instead of the anticipated 1,800 tons. As it turned out, a less quantity of bellite would have effected the work. This arises from the fact that the expansion of bellite is somewhat slower than that of dynamite, so that it does not so readily find the weakest point, and its action is more extensive and uniform. It did not break up the stone in the immediate neighborhood of the charge to the same extent as dynamite does, the work being more distributed. The work done was 11 tons of granite per pound of bellite used, a remarkably satisfactory result, although it must be remembered, as already pointed out, that the local conditions were more or less favorable.—*Iron.*

The Graham Draft Rigging.

This draft rigging which was fully described, with illustrations in the *Railroad Gazette*, March 29, 1889, is now controlled by the Solid Steel Company, of Alliance, Ohio. The company has completed arrangements to make all the parts and will at once put it on the market.

Highway Crossings and Interlocking on the Pennsylvania.

The following is a brief summary of the recent work on the New York division of the Pennsylvania Railroad toward the abolition of grade crossings. The railroad has submitted a proposition to the city to abolish the the crossings in Elizabeth. This is to be done by raising the tracks on an earth embankment, and passing over the Central Railroad of New Jersey. No offer appears to have been made to abolish crossings through Newark,

but the new station now under way at Market street will greatly lessen the dangers at this crossing by bringing the two main tracks closer together.

At Jersey City the work is well under way. The new passenger yard and turn table at Mt. Pleasant are almost finished, and before long the iron work will be under way. In Philadelphia, near Frankford, three crossings have been eliminated, as was explained in the *Railroad Gazette* Aug. 23.

At Metuchen a dangerous road crossing was got rid of by placing Main street under the railroad, and another overhead bridge is to be put up near the same point. East of Tullytown a road crossing was got rid of by an overhead bridge, and another one at Waverly in the same way.

The following interlocking machines are now nearing completion on this division: At Meadows a 17-lever non-interlocking machine for operating the switches of one of the "ladder" tracks in the freight yard. At Monmouth Junction a 34-lever-machine, with 14 additional spare spaces, to provide for the proposed rearrangement of tracks at this point. At Princeton Junction a 25-lever machine, and seven spare spaces. At Monmouth street, Trenton, a 23 lever machine, and five spare spaces. At Morrisville a 15-lever machine, and one spare space. At Cornwells a 23-lever machine, and nine spare spaces.

At Millstone Junction the 25-lever machine. with seven spare spaces, furnished by the Johnson Railroad Signal Co. has just been put in use.

Testing the Speed of Vessels.

In the recent tests of government cruisers, where the speed was measured by patent logs, some very anomalous results have been observed. Thus, in the trial of the "Baltimore," an observation showed a speed of 20.6 knots an hour, when the indicated horse power developed by the engines was about 200 less than that shown when the speed was only 19.6 knots. Two patent logs have occasionally been used in long runs, and in no case did they give the same indications, neither were their rates of variation constant. Now that the contracts for building men-of-war are usually made with a premium for increased and a penalty for decreased speed, referred to contract speed, an accurate method of measuring this speed becomes very important. Various plans have been suggested, the most feasible of which are as follows: To lay off a long measured course of 50 or 60 nautical miles, between prominent headlands, and to run the vessel over this course, in lieu of the four hours' test; to lay off a course of five or ten knots, over which the vessel shall be run back and forth, during a period of four hours, assuming that the speed when turning is the same as the average speed over the course.

The Fouling of Steel Ships.

The construction of a steel navy introduces a problem which confronted the designers of iron men-of-war many years ago, and forced the use of composition sheathing or composite construction. It is found that the bottoms of the new steel cruisers of the United States, which lie in harbors for weeks and months, become heavily coated with barnacles, and, moreover, that a destructive action occurs which pits and deteriorates the plates. The barnacles decrease the speed of a vessel to a very material extent, and it is now proposed to attach composition sheathing, preference being given to a bronze invented by Past Assistant Engineer John A. Tobin, U. S. A. The sheathing will increase the displacement, but it is calculated that the advantage of a clean hull will greatly overbalance this objection. At present it is necessary to dock the cruisers frequently and clean their bottoms. This operation is quite expensive, and might be impossible in case of hostilities.

A New Method of Uniform Tempering.

Schneider & Co., of Crenzôt, France, have recently secured patents for a processs of uniformlly hardening large bodies of steel by keeping the tempering baths at a constant, predetermined temperature. This end is attained by adding to the baths, as their temperature tends to rise, on account of the immersion in them of the hot metal, pieces of ice, nitre or lead, which, in melting, tend to reduce the temperature, keeping it practically constant. In order to harden at a temperature of zero degrees centigrade, therefore, the body under treatment is immersed in a water bath, to which pieces of ice are constantly added during the hardening process, the temperature of the bath thus being constantly maintained at zero degrees. If the hardening is to be effected under zero degrees, a bath of salt water is used, to which, as before, ice is added, so as to have always, at least, one piece of ice in the bath. If the tempering bath is to be of a higher temperature, molten lead or nitre is employed, solid pieces of these bodies being constantly kept in the baths, and thus keeping the temperature always at the point of fusion.

Improved Latowski Steam Bell Ringer.

Glaser's Annalen illustrates, in a recent issue, an improved form of the Latowski steam bell ringer for locomotives, noticed in The *Railroad Gazette* within the past year. In the earlier form of the apparatus, the steam, after having lifted the hinged cover of the steam chamber, escaped directly into the atmosphere; in the improved form, however, an arrangement is provided for leading the escaping steam into the stack. The new form is said to be already in extensive use, rapidly replacing the older type of apparatus. In a general way the Latowski bell ringer appears to meet with much favor even outside of railroad circles, having, for example, been found to be adapted admirably to ferryboat service.

Norwood Central Shops of the New York & New England.

At the shops of the New York & New England, at Norwood Central, Mass., business is very active. Under the direction of Mr. J. B. Henney, Superintendent of Motive Power, 100 freight cars a month have been built for the past six months. A large amount of work has been done on passenger equipment during this time. In the locomotive shops three large engines are being rebuilt, new boilers being put in place of the old ones.

There has recently been placed in the forge shop a 3,000-ton hammer and a 26 × 60-in. cylinder Corliss engine, with a fly wheel 15 ft. in diameter, 23 in. face and weighing 14 tons. A wheel lathe from the Pond Machine Tool Co., of Plainfield, N. J., has been put in the machine shop. This lathe will turn wheels up to 42 in. diameter.

All cars of through trains are being equipped with the steam-heating apparatus devised by Mr. J. A. Shinn, General Freight Agent. This system injects live steam from the engine into the water of the Baker heaters. One hundred cars are now equipped.

All the tail, switch and headlights used by the road are made at these shops, as well as all the brass castings, for which latter there is a well-equipped brass foundry.

The Absorption of Water by Building Materials.

Mr. C. Tollet has communicated to the recent Health Congress (France) the results of his experiments on the quantity of water which can be absorbed by building materials, and the time required to bring them to their normal state of dryness. The experiments were made with 60 specimens of ordinary materials. As to the quantity of water absorbed, the following results were obtained:

Material.	Water absorbed.		lbs. per cu. ft.
Calcined plaster, pulverized and in lumps	24.97	to	26.53
Concrete, composed of hydraulic cement and broken stones		17.48	
Flagstones and cements	4.99	to	12.48
Soft limestone	8.73	"	20.91
Hard limestone	7.49	"	10.61
Burrstones	4.99	"	12.48
Slate	0.62	"	5.62
Tiles	1.66	"	18.10
Bricks	3.74	"	20.99
Paving stones		1.25	
Sandstone		0.94	
Silicious sandstone	0.31	to	3.12
Oak		2.81	
Fir		3.12	

The absorption of water up to the point of saturation does not occur in the same periods nor at the same rate for the various materials, very marked differences being found in similar materials and in those of the same class. For slate and tiles, the maximum absorption is completed in an average time of six hours. Cement, burrstones, hard limestone and the woods require between two and six hours. Sandstone becomes saturated in two hours.

Drying in the open air proceeds very slowly for most of the materials. At the end of 64 hours, the soft limestones have lost about one-twelfth of the absorbed water, the burrstones four-fifths, fir, one-tenth; hard limestone and oak, one-third; bricks and cement, one-half. Certain slates, tiles, bricks, paving stones, silicious sandstone and fir part with their water of absorption very freely, being almost dry at the end of a few hours; and since these materials also absorb the least amount of water per unit of volume, they are to be preferred for construction purposes.

The Burning of Furnace Plates.

M. Hirsch has, during the past few months, been engaged in making experiments on the causes of the burning of the furnace plates of boilers, and finds that in many cases the introduction of oil into the boiler is decidedly dangerous. In making the experiments the inside of the boiler was painted with oil, and then filled and heated in the usual way. With certain oils it was found that the plates became much hotter than when water was directly in contact with them, and this difference of temperature increased as the fire was pushed, reaching 50 degrees Centigrade (122 degrees Fahrenheit) when the rate of evaporation was 31 lbs. of water per square foot per hour, and 200 degrees Centigrade (392 degrees Fahrenheit) when this rate was raised to 51 lbs. of water. In one instance, when the rate was not more than 35 lbs. of water per square foot of grate area, the temperature of the plate was found to be higher than 450 degrees Centigrade (842 degrees Fahrenheit), the melting point of zinc. To investigate the subject more fully, a tin flask was coated with oil in the way described above and filled with water. On heating this it was found that with certain oils the tin could be raised to a red heat even when exposed to but a moderate sized flame. Of the different oils, linseed is the worst, but colza runs it close. Naphtha does not occasion overheating unless it decomposes, which it is very liable to do if the heating is too rapid. Valvoline only occasions burning under excessive rates of evaporation. In general oils that are readily decomposed by heat were found to be especially dangerous, while mineral oils are comparatively safe.—*Engineering.*

Nicaragua Canal.

The formal opening of work on the excavation for this canal was made at San Juan del Norte Oct. 22, at 9:30 a. m.

Worsdell & Von Borries Engines.

The following is a list of the railroads on which engines built on the Worsdell & Von Borries compound system are running: Northeastern, Great Eastern, London & Southwestern, Belfast & Northern Counties, Prussian State, Alsace & Lorraine, Saxony, Wurtemburg, Italian Southern, Moscow & Warsaw, Royal Portuguese, Algeciras, Bengal Nagpur. The Nizam's State; Bombay, Baroda & Central India; Buenos Ayres State, Central Entre Riano, Buenos Ayres & Rosario, Northwest Argentine, Argentine Central Northern, Santa Fe & Cordoba, Central Argentine, Argentine Great Western, Anglo-Chilian Nitrate, Central Uruguay, Buenos Ayres Great Southern. Number of engines on this system now running, between 500 and 600.

THE SCRAP HEAP.

Notes.

An effort is being made in Montreal to start a joint stock company for the purpose constructing an elevated railroad in that city.

Near Birmingham, Ala., last week, a hand-car ran into a wagon at a road crossing. Another hand-car following ran into the first one and killed one of the trackmen.

The "Pennsylvania Limited," which seems now to be the name of the late "New York and Chicago Limited," running over the Pennsylvania Railroad, now has a ladies' maid.

The Pennsylvania Railroad has given $10,000 to its employés who suffered by the Susquehanna flood last June, most of the money being distributed between Sunbury and Renovo.

The New York *World* has sent a female reporter around the world, the intention being to make as quick a trip as possible. It is stated that the New York *Herald* heard of this move, and sent one of its men on two hours' notice by the same steamship to Liverpool with the intention of beating the woman if possible. A third newspaper woman, Miss Elizabeth Bisland, "22 years old, and possessed of beauty and intrepidity," has been sent by the *Cosmopolitan* magazine. She started west from New York Nov. 14, and expects to get back in 72 days.

In the Crookston Crossing case, the Duluth, Crookston & Northern has been granted permission to cross the St. Paul, Minneapolis & Manitoba tracks. The Manitoba people claim to have received all they asked for in the premises. The decision secured them protection from water brought down on the tracks of the D., C. & N., the latter being required to file a $10,000 bond to secure such protection. The latter company had never thought of trying to prevent a crossing, but only to delay it until this obligation was secured.

The Queen & Crescent route has, for over a year, been trying, with the aid of detectives, to find the trainmen who are guilty of extensive baggage robberies which have been committed on that line It will be remembered that some time ago an item was printed to the effect that this company had tried the experiment of fastening trunks and other baggage with seals, such as are used on freight cars. It is now stated by Western papers that Pinkerton detectives have arrested a United States express messenger, and that large quantities of goods have been recovered at a boarding house. It appears that by collusion between the baggageman and the express messenger, trunks were opened with false keys, and, after being robbed, were fastened so carefully that the robberies could not be located. The detectives say that the robberies aggregate $30,000.

Demurrage at Denver.

The following report of the Denver Demurrage Bureau has been issued. November, 1888, was the first month of the bureau's existence, and the October, 1889, figures show the progress made in eleven months. In computing the saving the cars are estimated to be worth to the companies 50 cents per day each:

Roads.	Nov. 1, 1888.		Oct. 1, 1889.		Total decrease for 11 months.	Amount earned, car to be worth 50 cents per day.
	Total No. loaded cars on track.	Total No. of days detained.	Total No. loaded cars on track.	Total No. of days detained.		
U. P. Ry	1,336	9,081	913	3,561	139,590	$69,795
D. & R. G.	346	2,286	233	810	37,290	18,645
D. U. & P.	330	2,145	221	663	33,770	16,885
B. & M. R.						
D. T. & F. W.	173	988	132	412	13,530	7,765
A. T. & S. F.	49	294	33	88	5,280	2,640
C. K. & N.	27	141	30	100	.....	1,141
Totals	2,261	14,938	1,562	5,634	229,460	$116,871

A Combination of Forge Companies.

The *American Manufacturer* states that 90 per cent. of the forge companies of the country have formed a combination for mutual protection. The companies who have thus far identified themselves with the new movement are: The Cleveland City Forge & Iron Co., Erie Forge & Iron Co., Erie; Hellenbacher Forge Co., St. Louis; Delaney Forge & Iron Co., Buffalo; W. S. Sizer, Buffalo; Nashua Iron & Steel Co., Nashua, N. H.; Bridgeport Forge Co., Bridgeport, Conn.; Central Forge Co., Whitestone, L. I.; Paterson Forge & Iron Co., Paterson, N. J., and the Duquesne Forge Co., of this city. The combination, it is claimed, has none of the features of a trust, as the several companies retain their identity and have complete charge of their works, so that the business will be carried on the same as usual. Some effort will be made to sustain prices which will allow a fair return on the capital invested. It is not the intention to establish any general office, but all matters affecting the combination, or questions of dispute between the different members, will be referred to a commissioner, who will be located at Cleveland, O.

Saxon Passenger Cars.

The Saxon third-class passenger cars were at first entirely open, and the second-class cars, though they had roofs, were protected at the sides only by linen curtains. As late as 1850 the third-class cars were not lighted, and at first no cars were lighted. Heating cars was practiced as early as 1840—much earlier than in most other European countries. Now nearly two-thirds of the cars are heated by steam.

Running Trains on Single Track in India.

From a communication sent us by a correspondent describing the three principal methods of handling trains on single track railroads in India, we condense the following:

The Madras Railway and some others operate a regular train-dispatching system similar to the American plan, but the dispatcher is generally the District Superintendent's clerk, and is supposed to get out of bed at any hour of the night when telegraphic movements are necessary, no night dispatcher being employed. On short lines the train staff and ticket system is used, the plan being identical with that in use in England, which most of our readers are familiar with. A third system, which has also been described before now, is the employment of a "pilot guard," who is a man dressed in red. This man takes the place of the staff, and is employed where single track working has to be inaugurated temporarily.

The East Indian, the Great Indian & Peninsular, and the Northwest railroads have what they call the "line-clear" system. This seems to be simply a plan for allowing station agents to act as train dispatchers for short sections of road contiguous to their respective stations, and must be rather clumsy; but it is stated that the consulting engineers to the government and all practical railroad men have a very high opinion of it. Two-thirds of the freight trains on the roads using this system are now run by native engineers.

Loss of Power in Transmission by Compressed Air.

Experiments of Prof. Radinger show that with a system of compressed air transmission, as used in Paris, for example, by the Popp Co., the loss of power amounts to 56 per cent. Improved machinery, it is thought, would effect a reduction to 47 per cent.

Railroads in South America.

In the matter of South American railroad development, it is of interest to note that at the end of the year 1888 Brazil had 5,358 miles of road in operation, while 945 miles were in course of construction. In the Argentine Republic the length of lines in operation on Dec. 31, 1888, amounted to 4,624 miles, while work on 2,874 miles was in progress.

Brooklyn Bridge.

A derailed switching engine on the Brooklyn Bridge stopped the cable trains 76 minutes at the busiest time of day last Wednesday morning. Six round trips were made on one of the tracks with a train hauled by a locomotive. It is estimated that from 12,000 to 15,000 people walked across during the interruption of the service. This is the longest interruption that has ever taken place since the bridge was opened.

The Car Stove.

The approach of another winter is signalized by another railroad wreck [eastbound passenger train on Pennsylvania at Pittsburgh Nov. 18; car overturned and coals from fire set fire to floor], in which the car stove figures as the chief agent of death. Promises have been made that the car stoves should be abolished; they have been removed from trains running through states prohibiting their use, and special merit is claimed for the steam-heating apparatus employed on other first-class trains. It is thus demonstrated beyond a doubt that steam heating is practicable, yet the car stove is allowed to remain in some passenger cars, wherever the law leaves it undisturbed. The accident at Pittsburgh should admonish legislative bodies, as well as railroad companies, that something more is needed than talk about the possibilities of steam heating.—*Philadelphia Public Ledger.*

An Electric Street Railroad.

The Tacoma-Seattle Electric Co. has been organized at Seattle, Wash., to construct an electric railroad between Seattle and Tacoma, a distance of nearly 30 miles. Charles H. French has been elected President and L. H. Randall Secretary.

Commissioners' Decision on the Palatine Bridge Collision.

The New York State Railroad Commission, after investigating the accident on the New York Central & Hudson River, near Palatine Bridge, Sept. 27, makes the following recommendations:

"*First*—That the New York Central & Hudson River Railroad Company amend Rule 87, so that it will read, "Passenger trains running in the same direction must keep not less than 10 minutes apart unless some form of block signal is used.

"*Second*—That the railroad company take into consideration the subject of equipping the entire line with block signals, and particularly that portion between Spuyten Duyvil and Croton, and submit to the Board of Railroad Commissioners an estimate of the cost thereof, and of the practicability of the same, so as not to interfere with the punctuality of service, particularly of local trains.

"*Third*—That all six-wheel trucks be equipped with a brake on every wheel instead of, as at present, brakes only on the outside wheel."

English Drivers and Firemen Take a Hand in.

At the recent congress of locomotive engine drivers and firemen in Leeds (England), resolutions were passed expressing satisfaction at the passing of the Railway Regulation Act of 1889, and urging the Board of Trade to insist upon the use of continuous automatic brakes and the absolute block system upon all railways without delay, directing the attention of the companies to the evils of long hours, and asking for an alteration in the present methods of testing the eyesight of railway men. Further resolutions were also passed as to other grievances, such as the absence of brake power upon fast goods trains, the practice on some lines of causing branch passenger trains to be worked by engines which are run tender first, the injuries caused to enginemen and firemen by the bursting of glass water gauges (which, it is suggested, should be protected by a wire casing), and the unnecessary risks run by the men and the public under the trip system.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Chicago, Burlington & Quincy, 1 per cent., payable Dec. 16.

Northern Pacific, 1 per cent. on the preferred stock, payable Jan. 15.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Alberta Railway & Coal Co., special, London, Eng., Dec. 2, to consider agreements entered into with other companies.

Atlantic & North Carolina, special, Newbern, N. C., Nov. 21, to consider a proposed extension.

Chicago, Kansas & Nebraska special, Topeka, Kan., Dec. 3, to consider a trackage agreement with the Kansas City & Beatrice.

Fort Worth & Denver City, annual, Fort Worth, Tex., Dec. 10.

Georgia Pacific, annual, Birmingham, Ala., Nov. 27.

Hudson Tunnel, annual, 2 Nassau street, New York City, Dec. 17.

Manitoba & Southeastern, annual, Winnipeg, Man., Dec. 10.

Montgomery, Tuskaloosa & Memphis, special, Montgomery, Ala., Nov. 18, to vote on a proposed increase of the capital stock.

New York Lake Erie & Western, annual, 21 Cortlandt street, New York City, Nov. 26.

New York, Danbury & Boston, annual, 96 Broadway, New York City, Nov. 25.

Pensacola & Atlantic, annual, Nov. 29.

Richmond & West Point Terminal, annual, Dec. 10.

South & North Alabama, annual, Montgomery, Ala., Nov. 30.

Suspension Bridge & Erie Junction, annual, 21 Cortlandt street, New York City, Nov. 26.

Tennessee Midland, annual, Memphis, Tenn., Dec. 4.

Wheeling & Lake Erie, annual, Toledo, O., Dec. 19.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at its rooms in the Phenix Building, Jackson street, Chicago, at 2 p. m.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, at 7:30 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Tift House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *Northwest Railroad Club* meets on the first Saturday of each month in the St. Paul Union Station at 7:30 p. m.

The *American Society of Civil Engineers* holds its regular meeting on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at Boston, at 7:30 p. m., on the third Wednesday in each month. The next meeting will be held at the American House.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 67 Washington street, Chicago, at 7:30 p. m., on the first Tuesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in St. Louis on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the house of the Club, 1,122 Girard street, Philadelphia.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at the Club rooms, No. 24 West Fourth street, Cincinnati, at 8 p. m., on the fourth Thursday of each month.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8:00 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the Fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets at Kansas City, Mo., on the first Monday in each month.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Club of Kansas* holds regular meetings on the first Wednesday in each month at Wichita, Kan.

Association of Engineering Societies.

A meeting of the Board of Managers is called for Tuesday, Dec. 3. It will be held at the office of the Chairman, Mr. Benezette Williams, 171 La Salle street, Chicago. The subject of closer union of the societies will be discussed and other important business transacted.

Civil Engineers' Club of Cleveland.

A regular meeting was held Nov. 12. The following were elected members: Charles Sumner Howe, George Washington Vaughn and Cecil L. Saunders.

Mr. Searles, for the Committee on Engineering, made a report. The committee felt that any overtures having in view the matter of a closer alliance between the club and the American Society of Civil Engineers should properly come from that society. A closer alliance with the other societies is also recommended. A resolution was adopted to the effect that the club will receive and carefully consider any communication from the committee of the American Society looking toward closer relations.

Mr. George Bartol read a paper on Recent Developments in Steel and Iron Manufacture. The club will meet again on Nov. 26 for a further discussion of this paper, and also to listen to papers by Mr. Warner, on Stellar Photography, and Mr. N. B. Wood, on Facts and Speculations Regarding the Planet Mars.

Engineers Club of Kansas City.

A regular meeting was held Nov. 4, Vice-President Breithaupt in the chair. John R. Braidwood and Robert M. Sheridan were elected members, and Thomas H. Ashburner associate. There was some discussion on the topic of Building Stones, a paper on which had been read at the October meeting. Short articles on Sewer Ventilation, by Mr. F. E. Sickles, and Sewage Disposal, by Mr. K. Allen, were read by the Secretary and discussed by Messrs. Pearson and Knight. A communication from Prof. Haupt on a plan for an outer harbor off Padre Island, Tex., was also read, together with other communications on the same subject. The plan contemplates building an iron pier 4,500 feet from shore, then constructing wharfage sufficient for 30 ocean-going steamers and 200 coasters. This was discussed by several members.

The Engineering Association of the Southwest.

This society has just been organized at Nashville, Tenn. The signers of the original call for the meeting to make the organization were: O. H. Landreth, Professor of Engineering, Vanderbilt University; Hunter McDonald, Engineer in Charge Huntsville Div., N. & C. R. R.; C. A. Locke, Engineer U. S. Government; E. C. Lewis, Member Am. Society C. E.; W. F. Foster, Engineer and Contractor.

The following are the salient features of the form of organization effected:

1. A membership comprising engineers of the various branches, architects, chemists, metallurgists, electricians, superintendents, etc., without restriction as to residence.

2. The establishment of society headquarters at Nashville, always open, comprising a technical reading room, office and meeting room.

3. A provision for the representation on the Board of Directors of the membership from each state.

4. Holding annual and monthly meetings for reading technical papers, and discussions, at Nashville and other prominent points to be chosen.

5. The submission of matters of importance, such as nominations and election of officers and members and amendments to the constitution, to the non-resident membership by means of written communications, letter-ballots, etc.

6. The rating of non-resident assessments and dues below those for residents.

The membership fees for the coming year have been adopted as follows:

	Resident fees.		Non-resident fees.	
	Entrance.	Annual.	Entrance.	Annual.
Members	$5.00	$8.00	$5.00	$5.00
Associates	4.00	6.00	4.00	4.00
Juniors	3.00	4.00	3.00	3.00

Correspondents are subject to no fees.

The first annual meeting of the association was to have been held at Nashville, Tenn., on Thursday, Nov. 21.

Engineers' Club of Philadelphia.

At the business meeting, on Nov. 2, 1889, President William Sellers was in the chair, and 18 members and three visitors present. Miscellaneous business was transacted. The resignation of Mr. Samuel Bell, Jr., was read and accepted.

The Secretary presented, for Mr. Edward Hurst Brown, a description of driving piles by water. There was some discussion by Mr. Frederic Graff and Prof. L. M. Haupt.

Mr. P. F. Brendlinger presented a very full and illustrated description of the grout pump and methods of grouting the New York Aqueduct. There was an extended general discussion of matters concerning this structure.

PERSONAL.

—Thomas Crockett has been appointed General Superintendent of the Temiscouata road.

—Mr. J. C. Conger, Superintendent of the Hot Springs road since 1875, has resigned and will retire from railroad service.

—Mr. John Kinsman, formerly Superintendent of the Eastern and other New England roads, died in Salem, Mass., Nov. 16.

—Mr. Donald Allen, Superintendent of the St. Louis & Henderson divisions of the Louisville & Nashville at Evansville, has tendered his resignation.

—Mr. T. C. Leake, Jr., Vice-President of the Tennessee Midland, and largely interested in other Southern railroads, died at his home in Richmond, Va., Nov. 16.

—M. J. H. Flagler has resigned as General Manager of the National Tube Works Co., and has been succeeded by E. C. Converse, Assistant General Manager.

—J. C. Loomis, Superintendent of the Louisville, Cincinnati & Lexington division of the Louisville & Nashville, has accepted a position as Superintendent of the Chesapeake & Ohio at Cincinnati.

—Mr. Percy R. Todd has resigned his position as General Freight and Passenger Agent of the Canada Atlantic, and will accept an important position in the freight department of the West Shore.

—Mr. George M. Farley, Engineer of Maintenance of Way of the New York & New England, has been appointed Superintendent of the Springfield & Western divisions, to succeed Mr. C. H. Platt, resigned.

—Major E. T. D. Myers, the well-known General Superintendent of the Richmond, Fredericksburg & Potomac, has been elected President of the road, in place of Mr. Joseph P. Brinton, who has resigned on account of ill health.

—Mr. W. F. Packard, Master of Transportation of the Kentucky Union, resigned Nov. 16 to go upon the Louisville & Nashville, in a somewhat similar capacity at Nashville. Before leaving, the employés of the Kentucky Union gave him a valuable diamond pin.

—Mr. Thomas Clark has been elected President and General Manager of the Norwich & New York Transportation Co., the steamboat connection of the New York & New England. Mr. Stephen A. Gardner, for some years Superintendent of the line, has resigned.

—Gen. Luke Lyman, Secretary of the Dominion Bridge Co., died at Montreal, Nov. 14. His remains were conveyed from Montreal, where he had resided since 1883, to his birth place at Northampton, Mass., where they were interred with military and masonic honors.

—Col. C. H. Wood, for some years past General Agent of the freight department of the Atchison, Topeka & Santa Fe, at Chicago, has resigned his position, and Mr. E. Copland, late General Agent of the Chicago, St. Paul & Kansas City, at Portland, Ore., has been appointed to succeed him.

—Mr. L. S. Robertson, Superintendent of the Owensboro & Nashville Division of the Louisville & Nashville, has been transferred and made Assistant Superintendent of the Louisville Division. Mr. John W. Logsdon, who has been General Agent at Florence, has been promoted to be Superintendent of the Owensboro & Nashville Division.

—Mr. R. E. Briggs, Chief Engineer of the Denver & Rio Grande for the past two years, resigned last week. It is understood, however, that he will remain with the company in another capacity. The office of Chief Engineer is to be abolished, the Division Engineer taking charge of the engineering work. Mr. Briggs was connected with the Union Pacific before going to the Denver & Rio Grande, and has seen considerable service in Mexico and Peru.

—Mr. Hamilton R. Johnston, General Freight and Passenger Agent of the Cincinnati, Jackson & Mackinaw, died of hemorrhage of the lungs at Fernandina, Fla., last week, where he had just arrived from Toledo in search of health. He was 39 years old and had been on the Pittsburgh, Cincinnati & St. Lonis several years, whence he went to the Cincinnati, Van Wert & Michigan, which was subsequently consolidated with the Cincinnati, Jackson & Mackinaw.

—Mr. Charles H. Platt, who has resigned his position as Superintendent of the Western and Springfield Divisions of the New York & New England to become General Manager of the New York Central & Hudson River, between the Grand Central Station and Mott Haven, N. Y., was last week presented with a handsome gold watch and fob, and a Masonic charm attached, while Mrs. Platt was the recipient of a handsome diamond lace pin, the gifts of the employés of the road under Mr. Platt. The presentation speech on behalf of the employés was made by a director of the road.

ELECTIONS AND APPOINTMENTS.

Aspen Southwestern.—The incorporators of this Colorado company are: H. A. W. Tabor, R. S. Ryan, M. K. Page, Peter McCourt and J. S. Pussey, all of Denver. The directors for the first year are H. A. W. Tabor, R. S. Ryan, J. S. Pussey, Peter McCourt, M. Walker and W. Walker, of Denver, and R. C. Walker, of Philadelphia.

Atchison, Topeka & Santa Fe.—Col. C. H. Wood, General Agent of the Freight Department at Chicago, having resigned, E. Copland has been appointed to succeed him, with office at No. 212 Clark street, Chicago.

Atlantic City.—Wilmer W. Salmon has been appointed Division Engineer, with office at Kaighn's Point, Camden, vice William G. Johnson, transferred.

Aylmer & Port Burwell.—At a meeting of the directors, held recently at Aylmer, Ont., D. Marshall was elected President; W. F. Emery, Vice-President; J. Winlow, Secretary-Treasurer.

Baltimore & Ohio.—The stockholders elected the following directors at the annual meeting this week;

James Sloan, Jr., W. F. Burns, Decatur H. Miller, W. H. Blackford, Aubrey Pearre, George DeB. Keim, Wesley A. Tucker, Maurice Gregg, J. Willcox Brown, Wm. F. Frick, Geo. A. Von Lingen, George C. Jenkins. The only changes are those caused by the withdrawal of W. G. Atkinson in favor of George A. von Lingen, and the election of George C. Jenkins, in the place of C. F. Mayer, the president of the company. There were 94,023 shares voted.

Birmingham & Shade's Mountain.—The following directors have been elected: D. P. Hale, President; J. G. Fowlkes, J. W. Bush, D. P. Hale, C. H. Spencer, W. M. Hale, W. W. Morgan and W. G. Hurd.

Brooklyn, Bath & West End.—The annual meeting of the company was held in Brooklyn Nov. 14, and the old board of directors elected as follows: John M. Butler, W. F. Snyder, Percival Roberts, William A. Ingham, John Dickey, Edward Roberts, Jr., Fred Prime, John L. Kates and Isaac Gerhart, all of Philadelphia. The directors re-elected Col. J. M. Butler President, W. F. Snyder Vice-President, and J. Horace Harding Treasurer.

Buffalo, Rochester & Pittsburgh.—The annual meeting of the stockholders of the company was held in New York, Nov. 18. Arthur W. Shennan was elected a director in place of John Meeser, but otherwise the old directors were re-elected as follows: Henry J. Barbey, Walston H. Brown, Henry Fatio, Adrian Iselin, John H. Hewart, Adrian Iselin, Jr., Wheeler H. Peckham, Auguste Richard, Alfred Roosevelt, A. H. Stevens, Frederick D. Tappen and J. Kennedy Tod.

Cape Fear & Cincinnati.—The officers of the road are as follows; Hon. Frank Brown, President; George B. Morton, Vice-President and Chief Engineer; Joshua Horner, Jr., Secretary; John Wilson Brown, Treasurer. The office is in the Neal Building, Baltimore, Md.

Central of Georgia.—B. J. Cubbedge has been appointed Superintendent of Terminals at Savannah, Ga.

Chattanooga, Gadsden & Birmingham.—The stockholders of the road have organized by electing the following board of directors: H. Herzberg Obal Christopher, A. L. Woodliff, L. W. Dean, S. W. Riddle, R. O. Randall, and J. M. Elliott, Jr., of Gadsden, Ala.

Chattanooga Southern.—At a recent meeting of the stockholders the following Board of Directors was elected: C. E. James, F. W. Allison, B. Greenwood, J. F. Smith, W. H. Hart, J. W. James and Franklyn Harris. The board elected J. W. James President, and Franklin Harris Treasurer, with office at Chattanooga, Tenn.

Chattanooga & Virginia.—The following are the names and addresses of officers of this company, which was recently organized at Chattanooga: John A. Hart, Chattanooga, Tenn., President; John D Imboden, Abingdon, Va., Vice-President and General Manager; A. W. Chambliss, Chattanooga, Secretary and Treasurer; Oramel Barrett, Abingdon, Va., Chief Engineer.

Chesapeake & Ohio.—W. J. McKee, Acting Superintendent of the Cincinnati Division, has been transferred to the Richmond, James River & Peninsular Division as Assistant Superintendent, with headquarters at Richmond. J. C. Loomis has been appointed Superintendent of the Cincinnati Division.

Chicago, Santa Fe & California.—A. E. Taylor has been appointed General Road Master in charge of maintenance of way, including track, bridges, buildings and water service. His headquarters will be at Fort Madison, Ia.

The office of Assistant Superintendent, in charge of terminals at Chicago, has been abolished, and all communications in relation to the same should be addressed to A. H. Crocker, Superintendent Chicago Division, whose jurisdiction has been extended to Chicago.

Cincinnati, New Orleans & Texas Pacific.—S. L. Corwine has been appointed Traveling Auditor of the line, with headquarters at Vicksburg, Miss., vice W. L. Benett, whose headquarters are changed to Cincinnati, vice M. F. Molloy, promoted.

Drummond County.—The following are the officers of this Quebec company: Charles Church, President; Thomas E. Fee, Vice-President; William Mitchell, General Manager.

Duluth, Red Wing & Southern.—The stockholders held their annual meeting in Red Wing, Minn., Nov. 14. The following officers were re-elected: President, F. W. Hoyt; Vice-President, S. B. Foote; Secretary, G. H. Crary; Treasurer, T. B. Sheldon; General Manager, L. F. Hubbard, Red Wing. Directors—L. F. Hubbard, F. W. Hoyt, T. B. Sheldon, G. H. Crary, S. B. Foote, of Red Wing; A. L. Stebbins, Rochester; M. J. Toher, C. E. Sheldon, Owatonna; C. R. Morse, G. W. Chinnock, River Falls; R. M. Todd, Albert Lee, J. W. Park, Balsam Lake, Wis.

Elberton.—At the annual meeting in Elberton, Ga., Nov. 14, the old Board of Directors and officers were re-elected.

Georgia Southern & Florida.—At the annual meeting last week the following directors were elected: H. J. Lamar, G. B. Turpin, F. S. Johnson, O. G. Sparks, Jr., and R. S. Collins. At a meeting of the directors H. J. Lamar was elected President; George B. Turpin, Vice-President, and R. S. Collins, Treasurer.

Kansas City, Nevada & Fort Smith.—This company, incorporated in Missouri last week, has elected the following officers: E. L. Martin, President; A. E. Stilwell, Vice-President; W. S. Taylor, Secretary; Churchill J. White, Treasurer; Richard Gentry, General Manager, and F. W. Bond, Engineer. The office of the company is at Seventh and Wyandotte streets, Kansas City, Mo.

Kansas City Suburban Belt.—The officers of this company are: E. L. Martin, President; A. E. Stilwell, Vice-President; W. S. Taylor, Secretary and Treasurer; A. L. Howe, Assistant Secretary and Treasurer, and J. W. Heylmun, Chief Engineer. The chief office is in Kansas City, Mo.

Kentucky Midland.—The old board of directors, Wm. Lindsay, D. W. Lindsay, E. H. Taylor, Jr., E. L. Samuel, J. T. Buckley, of Frankfort; Jas. E. Cantrell, of Georgetown; J. M. Thomas, Jas. E. Ferguson, of Paris, and W. N. Smoot, of Owensville, were re-elected at the annual meeting held in Frankfort, Ky., Nov. 13.

Knoxville & Ohio.—The annual meeting of the stockholders was held at Knoxville last week, and the following directors were elected: C. M. McGhee, Samuel Thomas, C. S. Brice, J. H. Inman, J. H. Hall, J. R. Rutherford, J. G. Moore, George Scott and E. J. Sanford. The following officers were elected: E. J. Sanford, President, and Charles Duclou, Secretary.

Louisville & Nashville.—John W. Logsdon has been appointed Superintendent of the Owensboro & Nashville, vice L. S. Robertson, appointed Assistant Superintendent of the Louisville Division, with headquarters at Louisville. W. S. Martin has been appointed Assistant Superintendent of the Nashville Division, and of the Nashville, Florence & Sheffield road, with headquarters at Nashville. The authority of C. S. Evans, Master of Trains of the Second Division, Main Stem, has been extended over the line between Nashville and Decatur. J. Overton Ewin has been appointed General Agent of the Nashville, Florence & Sheffield, with headquarters at Florence, Ala., vice John W. Logsdon.

Louisville, New Orleans & Texas.—The following changes and appointments have been made: W. F. Meath, late Freight Superintendent of the Memphis division, and Arthur Robinson, Superintendent of the Bayou Sara branch, have been transferred to the Riverside division.

Manatee & Sarasota.—W. C. Patten, Braidentown, Fla.; J. Hamilton Gillespie, Sarasota, Fla.; Joseph Voyle, Gainesville, Fla.; Henry N. Shepard, Boston, Mass., and J. H. Humphries, Braidentown, Fla., are the incorporators of this Florida company.

Mexican Gulf, Pacific & Puget Sound.—The Board of Directors has been increased to ten, and is now as follows: W. A. S. Wheeler, S. N. Van Praag, Dr. William H. Ross, Capt. J. M. Aiken, J. H. Cross, Dennis Burns and A. G. Moreno, of Pensacola; Daniel Macaulay and L. A. Van Praag, of New York; and William C. McLean, of Grenada, Miss.

Mexican National.—G. F. Wilcoxson has been appointed General Eastern Agent, with charge of both freight and passenger interests. His office will be at No. 317 Broadway, New York City.

New Haven & Derby.—At the annual meeting in New Haven, Conn., Nov. 19, it was voted to reduce the number of directors from 13 to nine. The directors chosen are: Thomas Wallace and Franklin Farrell, of Ansonia; N. D. Sperry and S. E. Merwin, of New Haven; William H. Stevenson, of Bridgeport, and J. L. McCauley, Henry Hentz, E. V. Carey and M. E. Stone, of New York. J. A. Bostwick, of New York; William E. Downes, of Birmingham, and E. N. Shelton, of Ansonia, retired from the board. Col. William H. Stevenson was re-elected President, and A. J. Porter was chosen Secretary and E. C. Robinson Treasurer. The office is to be removed from New Haven to Bridgeport.

New York & New England.—George M. Farley has been appointed Superintendent of the Western Division, in place of C. H. Platt, resigned. His headquarters will be at Hartford, Conn.

Norwich & New York Transportation Co.—The annual meeting of the company was held at Norwich, Conn., last week, and the following directors were elected: William H. Hart, W. P. Shinn and George H. Ball, Boston; Thomas B. Eaton, Worcester; Moses Pierce, Norwich; Oliver Woodworth, New London; Charles W. Copeland and William A. Starbuck, New York, and Thomas Clark, North Stonington, Conn. The resignation of S. A. Gardner as Superintendent was accepted, and Thomas Clark was elected President and Manager, and Oliver C. Johnson, Jr., was re-elected Secretary and Treasurer.

Petersburgh.—At the annual meeting of the stockholders in Richmond, Va., Nov. 18, the following officers were elected: President, Col. John B. Palmer. Directors: B. F. Newcomer, W. T. Walters and H. Walters, of Baltimore; Dr. D. W. Lassiter and Maj. H. R. Scott, of Petersburgh.

Philadelphia & Seashore.—The incorporators of this New Jersey company are: Morris Boney, Charles W. Potts, George H. Becker. Edward R. Wood, John J. Deery and William Gorman, of Philadelphia; Theophilus Weeks and Anthony Steelman, of Tuckahoe, N. J.; James McCray and James M. E. Hildreth, Cape May; Robert D. Cox, Mount Laurel; W. R. Van Gilder, Petersburg; Thomas E. Ludlam, George W. Urquhart and M. J. Kelly, Sea Isle City, and Anderson Bourgeois, of Estellville.

Port Discovery, Quilayute & Olympia.—The following are the officers and directors of this company, recently incorporated in Washington: Directors—Russell Glover, William Hays, M. A. Sawtelle, W. C. Williams and B. W. DeCourcy. Officers—President, Russell Glover; Vice-President, William F. Hays; Secretary and Treasurer, M. A. Sawtelle; General Superintendent, W. C. Williams; Chief Engineer, B. W. DeCourcy.

Portland & Puget Sound.—Chester W. Collins, John D. Kilpatrick, William H. Kilpatrick, John H. Smith, Edward T. Johnson, S. Hoffman and Emil Adler are named as trustees in the charter filed in Washington.

Poughkeepsie & Hudson.—John V. Clarke, J. Mullin, John F. Moffett, D. G. Griffin, Henry C. Hodgkins, Geo. V. S. Camp, Frank Walts, Homer H. Rice, S. T. Woolworth, P. Norton, Watertown, N. Y.; C. T. Moffett, E. C. Cooke, Syracuse, N. Y., and C. H. Burlingame, Providence, N. Y., are the directors of this company, recently chartered in New York.

Richmond & Petersburgh.—At the annual meeting of the stockholders in Richmond this week the following directors were elected: W. T. Walters, H. Walters, H. K. Ellyson, Dr. D. W. Lassiter and Col. John B. Palmer.

St. Louis, Grand Tower & Southern.—The following officers have been elected: H. Bracy, Vice-President and General Manager; M. W. Porterfield, Secretary; B. G. Bracy, Treasurer, and T. E. Bracy, Superintendent of Construction. The general offices are at 811 Chestnut street, St. Louis, Mo.

St. Paul, Minneapolis & Manitoba.—E. S. Jackson has been appointed General Agent of the road in charge of Pacific Coast traffic, with office at Portland, Or.

Seneca & Nemaha Valley.—The following are the directors of this new Kansas company: J. E. Taylor, George W. Williams, S. L. Davis, John A. Gilchrist, Simon Conwell and Richard Johnson, of Seneca; C. S. Cummings, of Centralia; N. B. McKay, of America City; Eph. McKee, of Havensville; J. M. Kandall, of Corning, Kan., and William Kelley, of Memphis, Tenn.

Southern Pacific.—J. B. Agnal, local Auditor of the Texas & Pacific at Houston, Tex., has been appointed General Traveling Auditor of the Atlantic system of this road.

Southwestern Construction Co.—This company has been incorporated in Kansas by George W. Booth, G. A. Walkup, E. E. Wise and H. A. Christy, of Chicago; S. A. Darrough, of Anthony, Kan.; William E. Hutchinson and A. J. Lusk, of Hutchinson, Kan.

Temiscouata.—Thomas Crockett has been appointed General Superintendent of the road, with office at Riviere du Loupe, Que.

West Florida & Atlantic.—The following officers have been elected: President, J. D. Pirong; Vice-President, B. F. Howland; Treasurer, John Barr Glen; Secretary, J. H. Hamilton, and General Superintendent, J. McReynolds. The headquarters of the company are at St. Andrews, Fla.

Wilson Terminal.—The directors of this New York compaey are: Thomas C. Walton, Norfolk, Va.; Walter N. Harris, Patrick G. Close, Henry B. Hunt, Toronto, Canada, and Hervey Sanford, James J. Harrington and Hezekiah Seeley, of Wilson, N. Y.

OLD AND NEW ROADS.

Allentown Terminal.—The company has formally filed a copy of a lease of its property to the Philadelphia & Reading and the Lehigh Coal & Navigation Co., the latter company assigning its interest to the Central of New Jersey. The rental is the interest on $450,000 four per cent. bonds and five per cent. on the capital stock of the road. Two-thirds of this is to be paid by the Central of New Jersey and the other third by the Philadelphia & Reading. Improvements are to be made by the lessees.

Aspen Southwestern.—This company has been incorporated in Colorado to build a road from Aspen up Castle creek to Ashcroft, 15 miles south of Aspen near Pearl Pass, on the county line between Pitkin and Gunnison counties. The capital stock is $500,000.

Baltimore & Ohio.—The annual meeting of the company was held in Baltimore Nov. 18, at which the annual report was read. It shows: "That the gross earnings in 1889 were $21,303,001, an increase over 1888 of $949,510. The expenses were $14,810,844, an increase of $610,283. The net earnings were $6,492,157, an increase of $339,227. The income from sources other than the operations of the property was $1,265,861, an increase of $58,900 over 1888. The available income for the fiscal year was $7,400,367, an increase of $344,895 over 1888. The interest on the bonded debt, rentals, taxes and other charges were $6,208,562, a decrease of $37,900 as compared with 1888, and after their payment and the payment of $300,000 (six per cent. dividends) on $5,000,000 preferred stocks, and the payment of $372,487 in reduction of the bonded indebtedness, there remained a balance of $519,318, $394,886 more than for the fiscal year of 1888. The tonnage carried in 1889 was 12,161,380 tons, or nearly 1,000,000 tons more than in 1888. The company has expended this year in betterments $1,529,101, as against an expenditure last year of $2,943,367. Of these expenditures $881,425 were for lines east of Baltimore, chiefly for rights of way; real estate on the Philadelphia & Schuylkill River East Side roads; for the construction of branch lines to the steel works at Steelton; for completing the double track on the Philadelphia Division, and of docks and wharves. The expenditures on the main stem, $345,392, are mainly for constructing second track on the metropolitan branch, completing certain branch lines, and for floating equipment for the harbor of New York.

The company has again charged off to "profit and loss" to Sept. 30, 1889, the sum of $607,617 for depreciation of equipment, including engines and cars condemned and destroyed. This is in addition to the sum of $4,000,000, which was charged to "profit and loss" during the previous fiscal year. The company has maintained its sinking funds, has paid to the city of Baltimore $40,000 on account of the purchase of its interest in the Pittsburgh & Connellsville road and has made its second annual payment of $250,000 in reduction of its car trust bonds of $2,500,000. The Turtle Creek bonds of the Pittsburgh & Connellsville, amounting to $326,000, which matured Aug. 1, 1889, were paid out of the proceeds of a like amount of consolidated mortgage bonds of the company, which, under its consolidated mortgage, has been set aside for that purpose. The directors recommend the stockholders to give authority to endorse $700,000 of the first mortgage five per cent. bonds of the Monongahela River road, now under construction through the coal fields lying between the main line at Fairmount and the Parkersburg branch at Clarksburg, W. Va.

A survey is being made for a line from Knowles Station, on the Metropolitan Branch, south to the chain bridge in the District of Columbia.

Belleville, Centralia & Eastern.—The grading on this extension of the Louisville, Evansville & St. Louis Consolidated has been completed from Mount Vernon westerly through Centralia to Belleville, Ill., where the road connects with the Illinois & St. Louis, over whose tracks it enters St. Louis. The tracklaying has been completed to within a few miles of Centralia, and is expected to reach Belleville before Jan. 1.

Birmingham & Shade's Mountain.—This company has been chartered in Alabama to build a road from Hale's Springs to Grace's Gap, and thence to Birmingham, Ala., a distance of about eight miles. Much of the right of way has been already secured. It is intended to make Hale's Springs, which is at a considerable elevation above Birmingham, a summer resort.

Calgary & Edmonton.—This company is applying to the Dominion Parliament for a charter for a road from a point on the Canadian Pacific or Bow River, at Calgary, Alberta, to Edmonton, and southerly to the international boundary, and also northerly to Peace River. Kingsmill, Cattanach & Symons, of Toronto, are the solicitors for the company.

Canadian Pacific.—A party of engineers have started to survey the route of the Kootenay & Columbia River road, for which the Canadian Pacific obtained a charter and land grant at the last session of the Provincial Legislature. The proposed road will run from Sproot's Landing to Nelson, Manitoba, and steamboats will connect with the Canadian Pacific at Revelstoke, British Columbia.

Catskill & Cooperstown.—The survey has just been completed for this road, which has been referred to previously under the heading of Cooperstown & Charlotte Valley. The surveyed line is about 60 miles long, and extends from Davenport, N. Y. to East Durham, N. Y., and connects the Cooperstown & Charlotte Valley with the Catskill Mountain road, making a shorter and better line to the Catskill Mountains, and also to Cooperstown and Richfield Springs, N. Y. The survey crosses two

summits, each about 2,000 ft. above tide water. The maximum grades are 95 ft. per mile, and the maximum curves are seven degrees. There will be but little bridging, no tunnels, and the cost of construction will be comparatively cheap for a mountainous country. F. B. Morse, of Red Falls, N. Y., is Chief Engineer.

Centralia & Chester.—The company has filed for record in Illinois a mortgage for $1,610,000 made in favor of the Farmer's Loan and Trust Co., of New York. The road is now graded from Chester to Centralia, and is in operation from Sparta to Colterville, Ill. The company has a charter to extend the road from Centralia north to Altamont, but it will probably not be built beyond Salem at present. At Salem connection is made with the Ohio & Mississippi.

Chicago, Milwaukee & St. Paul.—The road has filed for record in Wisconsin a mortgage for $5,000,000 in favor of the United States Trust Co. to secure $5,000,000 convertible income bonds, authorized in 1886, and of which $2,000,000 had been sold up to the end of the last fiscal year, June 30, 1889. This mortgage is entirely separate from the consolidated mortgage of $150,000,000.

Columbus & Cincinnati Midland.—The bondholders' committee of the road, in their adjustment with the Baltimore & Ohio of the interest on $2,000,000 first-mortgage bonds, are understood to have accepted 4½ per cent. The bonds are to be guaranteed, principal and interest, by the Central of Ohio and by the Baltimore & Ohio Railroad. The three per cent. interest coupon due Jan. 1 next is to be provided for in full in cash. These conditions are to apply only to those who deposit their bonds under the committee's plan. The bonds now draw six per cent. interest, and the Baltimore & Ohio, the lessee, claims that the road does not earn operating expenses.

Denver, Utah & Pacific.—Amended articles of incorporation of the road were filed this week in Denver. The road was some time ago purchased by the Chicago, Burlington & Quincy, and extends from Denver to Lyons, a distance of 44 miles. The amended articles provide for the extension of the line across the mountains into Middle Park, with branches extending southward into the Gunnison region.

Deshler, Napoleon & Northwestern.—This company has filed articles of incorporation in Ohio to build a road from Deshler through Henry County to Napoleon, a distance of about 25 miles. The capital stock is $100,000.

Des Moines & Northern.—The company has filed articles of incorporation in Iowa. The company is a reorganization of the St. Louis, Des Moines & Northern, which has been operating a narrow gauge line between Des Moines and Boone, Ia., 42 miles, but which is to be sold this week under a foreclosure suit of the Mercantile Loan & Trust Co., of New York. The road will be made standard gauge, and it is understood that a traffic arrangement has been entered into with the Chicago, Milwaukee & St. Paul, by which the latter's trains will be run into Des Moines. It is said to be the intention of the new company to extend the line to Webster City in the spring.

Dover & Statesboro.—This road has been completed from Dover south about 15 miles to Statesboro, Bulloch County, Ga. The line was built by a local company, and it is proposed to continue it to Waycross. J. H. Burckhalter has the contract for grading. F. T. Lockhart, of Augusta Ga., is president.

Drummond County.—This road will be opened in a few weeks between Drummond and Nicolet, P. Q. The extension to Nicolet was begun last fall. The line from Drummondville to St. Leonard, 18 miles, has been in operation for some time, and the 17 miles from St. Leonard to Nicolet is now being ballasted. The road passes through rich timber lands. There are three heavy iron and steel bridges, one over the St. Francis at Drummondville, and the other over span the two branches of the Nicolet River. The company receives a subsidy of $3,200 per mile, for 30 miles, from the Dominion government. William Mitchell is General Manager.

Duluth, Crookston & Northern.—The road would have been completed to Crookston, Minn., some weeks ago but for the delay over the crossing of the St. Paul, Minneapolis & Manitoba. The case was finally taken to the courts and last week the road completed its crossing and the first train over the road arrived in Crookston, Nov. 14. Regular trains will soon be running between Crookston and Fertile. At the latter place connection is made with the Northern Pacific.

Elberton.—The directors of the road, now part of the Atlanta & Charlotte division of the Richmond & Danville, have decided to change the gauge from three feet to standard. It extends from Elberton to Toccoa, Ga., 50 miles, and is laid with 30-lb. rails.

Ellensburgh & Northeastern.—Work on this Washington road has been pushed with much vigor, and it is now graded to the foothills on the eastern side of the valley. The contract for the next ten miles will probably not be let this season. The road is projected from Ellensburgh to the Okanagon River, a distance of 116 miles.

Evansville & Richmond.—The road is now completed to Seymour, Ind., and regular passenger and freight service between Evansville and Seymour will be established on Dec. 1. Work on the eastern division is progressing, and it is expected to have the line completed and in operation to Richmond, 130 miles from Elnora, the western terminus, July 10.

Fairhaven & Southern.—The surveyors on this Washington line are encamped at Halls, near the international boundary line, and have commenced the location of the permanent survey for the road from there.

Fort Scott Terminal.— This company was organized last month in the interest of the Missouri Pacific to build a belt line at Fort Scott, Kan. The company obtained permission of the city to lay rails on a certain street occupied by the tracks of the Missouri, Kansas & Texas, which it was authorized to remove. This was done, but an injunction was served, preventing further interference. The Fort Scott Terminal Company took the case to the State Board of Railroad Commissioners. The Missouri, Kansas & Texas contended that the Commissioners had no authority in the case, as the road was in control of the United States Court. The Commissioners held that the rights of the United States only extended to operating the road and its management for the owners, and that it but assumed duties of the former officers; that the right of eminent domain was vested only in the state, and that the state had power to control as such guarantee of privileges. The application of the Fort Scott Belt road was granted.

Fountain Head.—This company, recently organized in Tennessee, has filed articles of incorporation in Nashville. It proposes to build a road from Knoxville to Fountain Head, Knox County, Tenn. F. A. R. Scott, J. C. White, S. H. Cruze, John B. Neilly and S. H. George are the incorporators.

Galt & Waterloo.—The survey for the extension of this road to Elmira, Ont., is about completed. A number of large trestles will have to be built. The span over the Conestogo River, at St. Jacobs, will be about 200 ft. long and 40 ft. above the water, and the one crossing the Canagagigue, at Elmira, will be of somewhat similar dimensions. The road will cross the highway at five different places.

Harvey & Salisbury.—Vernon Smith, Chief Engineer, reports that the survey will be completed this month, and that two months will be occupied in preparing plans, etc. The two routes surveyed start from Harvey, N. B., and continue to Frederickton and around the Grand Lake until Wilson's Brook is reached, Salisbury being 12 miles distant, and Berry's Mills 16.

Illinois Central.—The net earnings from traffic for the four months ending Oct. 31, 1889 and 1888 (October, 1889, estimated), were as follows:

	1889.	1888.	Increase.
Miles	2,275	1,953	322
Gross earnings	$4,951,678	$4,035,733	$915,945
Oper. expen. and taxes.	2,820,198	2,614,106	206,092
Perm. expend. paid from income	104,354	98,351	6,003
Total expenses	2,924,552	2,712,457	212,095
Net earnings	$2,027,126	$1,323,276	$703,850

The Dubuque & Sioux City reports its gross and net earnings for the four months ending Oct. 31, 1889 and 1888 as follows (October, 1889, estimated):

	D. & S. C. 1889.	D. & S. C. 1888.	Ced. F. & Minn. 1889.	Ced. F. & Minn. 1888.	Both Roads. 1889.	Both Roads. 1888.
Gross Earn.	$657,354	$666,030	$34,401	$35,356	$691,755	$701,386
Op. Ex. & Taxes.	463,992	490,967	55,072	42,752	519 064	533,719
Net Earn.	$193,362	$175,063	df. $20,671	df. $7,396	$172,691	$167,667

The Dubuque & Sioux City has also expended on permanent improvements $61,546, which has been charged to capital account; the amount so spent and charged in 1888 was $50,976.

Indiana & Illinois Southern.—A decree has been issued ordering this road to be sold at foreclosure sale. The road extends from Effingham, Ill., to Switz City, Ind., 91 miles.

Kansas City Suburban Belt.—Smith & Bradbury, of Kansas City, Mo., have the contract for the 5¼ miles of double-track road now under construction, which it is expected to have completed by Feb. 1 next. The road is to extend from Second street and Broadway, through the East Bottoms, down the valley of the Blue and Brush Creeks and around Kansas City, Kan. The Kansas City Terminal Construction Co. is the name of the company building the line. J. W. Heylmun, of Kansas City, is Chief Engineer.

Kinderhook & Hudson.—Grading has been nearly all completed on this road between Kinderhook and Hudson, N. Y., 16 miles, and tracklaying has been commenced by Moffett, Hodgkins & Clark. E. G. Ferris, of Hudson, N. Y., is Chief Engineer.

Kings County Elevated.—This comparatively new elevated road, extending from the Fulton Ferry, Brooklyn, N. Y., eastward to the Twenty-sixth Ward of that city, has lately been extended one-half mile, and is now 6½ miles long. The new portion was built under a separate charter, the corporate name being the Fulton Elevated Railway Co. The eastern terminus is now at Van Sicklen avenue, which is near the eastern terminus of the older Brooklyn Elevated. Ground has been secured here for yards sufficient to hold 100 cars, and repair shops and an engine-house are now being built at Alabama avenue. This company proposes to build a new station at the terminus of the New York & Brooklyn Bridge, making this point a way station and running all trains through to and from Fulton Ferry.

Louisville & Nashville.—Clarksville, Tenn., has subscribed the $50,000 asked by the company to secure an extension of the road from Clarksville, on the Memphis line, south to Dickson, connecting there with the Nashville, Chattanooga & St. Louis road. It is understood that work will be begun as soon as arrangements can be made.

Louisville, New Orleans & Texas.—The Mobile & Northwestern road, extending from Glendale, Miss., to Eagle Nest, 19 miles, and operated by this road, is being changed to standard gauge. The work is now nearly completed.

Manatee & Sarasota.—This company has filed a charter in Florida to build a road from some navigable point on the Manatee River to Sarasota, Manatee County, a distance of about 20 miles. Canals are to be built in connection with the railroad. The capital stock is $50,000.

Mexican Roads.—The Mexican government has granted a concession for a road from Matamoras to Tuxpan, and thence to the Tehuantepec road and to some point in Yucatan, with branches from Tuxpan to the Guatemalan frontier and to the City of Mexico.

Mobile & Dauphin Island.—It is claimed that grading will be resumed on this road next month. Surveys are now being made from Mobile south, 36 miles. The maximum grade will be 40 ft. to the mile and the maximum curve three degrees. H. Austill, of Mobile, Ala., is General Manager and F. K. G. Wright is Engineer in Charge.

New Roads.—Grading is in progress on a road being built by the Laury & Jackson Lumber Co., from Laury to Piedmont, Ala., a distance of 20 miles The surveys have been made, and the line will probably be opened Jan. 1. P. S. Fitzgerald, of Gadsden, Ala., is Chief Engineer.

The Paint Rock Coal & Coke Co. has awarded a contract for building a road four and a-half miles long to its coal mines. The work will generally be very light, with a maximum grade of three per cent. There will be one tunnel 400 ft. long. H. S. Bosler, of Oneida, Tenn., is Chief Engineer.

Thomas E. Hugehes and others, of Fresno, Cal., are organizing a company to build a road from Fresno to Monterey, Cal., a distance of 130 miles. It is stated that a capital stock of $3,500,000 has been subscribed.

A local company is being organized at Anson, Jones County, Tex., for the purpose of building a road from Anson south, about 15 miles, to Abilene, on the Texas & Pacific. H. A. McEachin, of Anson, is interested in the project.

Steps are being taken to secure a charter for a road from Drummondville, P. Q., through L'Avenir to Melbourn or Richmond.

New York & New England.—The following is the report of the company for the year ending Sept. 30:

	1889.	1888.	Inc. or Dec.
Gross earnings	$5,563,407	$5,268,407	I. $295,000
Other income	3,699	5,043	D. 1,344
Total gross	$5,567,107	$5,273,451	I. $293,656
Oper. expenses	3,718,782	3,511,090	I. 207,692
Net earn	$1,848,324	$1,762,361	I. $85,963
Taxes	238,789	229,010	I. 9,779
Insurance	12,850	9,502	I. 3,348
Rentals	383,272	353,748	I. 29,528
Interest	1,013,133	999,238	I. 13,895
Div. on pref	170,341	139.416	I. 30,925
Total charges	$1,818,387	$1,730,911	I. $87,476
Surplus	29,937	31,450	D. 1,513

The increase in interest is due to an increase of about $7,000 on Boston Terminal and an increase of about $11,000 on second mortgage. There was a decrease of about $4,000 on car trusts. Operating expenses were the least per train per mile and per ton per mile in the history of the company.

Nominingue.—The Quebec government has consented to advance $25,000 to this company. The Canadian Pacific is to give a guarantee of $4,000 per mile, on condition that five years after the completion of the road it can purchase it for $6,000 per mile. Meanwhile, the Canadian Pacific will operate each section as finished and give 40 per cent. of the profits to the shareholders. It is estimated that the road will cost $15,000 per mile. Work on the section extending between St. Jerome to Ste. Agathe, Quebec, is to be commenced at once.

Nova Scotia Midland.—Ground was broken on this road at Springvale, N. S., last week. The road is to extend from New Glasgow and Springville southeast to Whitehaven, near Guysborough Harbor, a distance of about 60 miles. Guysborough is a port open all the year, and the road is expected to have a heavy traffic from the mines at New Glasgow. Oakes & Wheten are the contractors, and G. Rodman Price, of Springville, is Chief Engineer.

Nova Scotia South Shore.—This company is being organized to construct a road from Yarmouth to Shelburne via Arcadia, Riverdale, Tusket, Belleville, Eel Brook, Argyle, Pubnico, Barrington and Clyde: and from Shelburne eastward to the counties of Queens and Lunenburg. The capital stock is $250,000.

Old Colony.—At the annual meeting, Nov. 26, the stockholders will be asked to authorize the construction of the following branches: A line extending the Milton branch to a connection with the Boston & Providence; also a line from a point on the West Roxbury branch to a point on the Northern division at or near Sherborn; an extension of the Wrentham branch to a connection with the Boston & Providence, near the Pleasant View station.

Oregon Railway & Navigation Co.—The company has agreed to build a branch, 20 miles long, from La Grande, Ore., north across the Grande Ronde Valley to Elgin, Union County, if free right of way is obtained. This is now being secured.

Peninsula.—The Mexican government has granted a concession to Miguel Peon, Sixto Garcia and José Dominguez Peon for constructing a narrow-gauge road from Mérida to Campeche, with branches to the town of Hunucmá and to the towns of Abalá and Muna. Construction will begin both from Mérida and Campeche, and the line must be completed in four years. A subsidy of $6,000 per kilometre is granted. Maximum passenger rates allowed are, per person transported, 1 kilometre: First class, 2 cents; second class, 1½ cents; third class, 1 cent. Maximum freight rates, per ton per kilometre: First class, 5 cents; second class, 4 cents; third class, 3 cents.

Pennsylvania.—The company has given notice that it has decided to abandon that portion of the Pennsylvania Canal between Bald Eagle Dam, in Clinton County, and Loyalsock Creek, in Lycoming County, Pa., a distance of about 35 miles, and intends to build a railroad between these points.

A four-mile extension of the Williamsburg branch of the Altoona Division has been built from Williamsburg to Cavedale and Cariin, Pa.

Philadelphia & Seashore.—This company filed its articles of incorporation in New Jersey this week to build a road from Winslow Junction, on the Atlantic City road, south to Sea Isle City, a distance of 54 miles. The capital stock is placed at $900,000.

Pike's Peak.—Work on the Pike's Peak rack rail road has been suspended, owing to the heavy snows. A large force has continued at work until recently, but much of the time in heavy drifts, and but little has been accomplished. The work will be resumed on the lower end of the road if snows in lower altitudes do not continue.

Portland & Puget Sound.—This company, which was chartered in Oregon Nov. 15, has also filed articles of incorporation in Washington. The proposed road is to extend from Portland to Seattle, with branches up the Lewis River and the south fork of Lewis River, and to Gray's Harbor and Port Townsend. The capital stock is $5,000,000.

Puget Sound & Gray's Harbor.—Track on this road has been laid to Montesano, Wash., and construction trains are now running to that point. Passenger trains are running regularly from Kamilche to Summit, 19 miles, and from there to within seven miles of Montesano. As soon as the ballasting on this section is completed trains will begin running from Kamilche to Montesano, 36 miles.

Qu'Appelle, Long Lake & Saskatchewan.—The company will ask Parliament during the approaching session to confirm an agreement, dated Aug. 7 last, between it and the Canadian Pacific, under which the latter is to lease and operate the road between Regina and Prince Albert, and may acquire it on specified conditions. The name of the former company is also to be changed.

Richmond & Chesapeake.—It is stated that Mason, Hoge & Co., have been awarded a contract for completing the tunnel at Richmond, Va., and grading the road

to a ferry connection with the Baltimore & Drum Point, at Piny Point, Va.

Richmond, Fredericksburg & Potomac.—At the annual meeting in Richmond, Va., Nov. 20, the stockholders authorized the Board of Directors to issue, for the purpose of additional equipments, double tracking the road and constructing the belt line at Richmond, bonds to the amount of $2,500,000, secured by a mortgage on the road.

Richmond & Petersburg.—At the annual meeting in Richmond last week the stockholders authorized the directors to issue $1,000,000 bonds if needed, or such amount as may be found necessary, to provide funds for double tracking the road, constructing the belt line connection around Richmond with the Richmond, Fredericksburg & Potomac, providing additional equipment, and for other improvements. Referring to the belt line at Richmond, the annual report states that the company has bought about 90 acres of land at the junction of the James River branch, a mile south of Manchester, and all the right of way (about 40 acres) to extend the line to the north side of the James River, west of Richmond. Much of the work on this branch has been done, but the completion of it will be delayed by legal difficulties concerning the connection on the north side. The rapid increase in tonnage of through freight business has made this connection necessary. Even if the city of Richmond would permit the continued use of the connection track through the city, the physical difficulties in handling trains would be very great. The present bridge and tracks are inadequate, and at times blockades of over 200 cars have occurred on the Manchester side. The cost of the connection will be very great, but it is absolutely necessary.

Roanoke & Southern.—This company has asked Roanoke, Va., to subscribe $100,000 to the road, in addition to the $100,000 already subscribed by the town. If the additional amount is voted work is to be commenced at Roanoke early in the spring. Eighteen miles of the road is now in operation, and the track is being laid on 12 miles more, and by Jan. 1 it will be completed almost to Martinsville, Va., 53 miles from Roanoke.

Rochester & Lake Ontario.—The application of the company for permission to cease the operation of its road during the coming winter season has been denied by the State Board of Railroad Commissioners, New York. The road extends from Rochester to Lake Beach, six miles.

St. Paul, Minneapolis & Manitoba.—F. C. Hollins, of New York, has, as a stockholder, begun an action in the Supreme Court of New York to restrain the company from leasing its road for 99 years to the Great Northern Company, and from transferring its $22,000,000 of assets to the same corporation, as proposed in a circular issued in pursuance of a vote of the shareholders by the President a few weeks ago. The principal objections alleged against the transfer are that it is proposed to give away all the earnings of the road above six per cent. per annum, without any consideration, while the average earnings of the corporation for several years have been seven per cent.; that no security is given beyond transferring the company's own property that the Great Northern will carry out the terms of the lease; that stockholders of the St. Paul, Minneapolis & Manitoba who do not subscribe to the stock of the Great Northern will be deprived of their just share in the $22,000,000 assets sought to be transferred, and that the proceedings proposed by the circular are a wrongful division of corporate property and contrary to law.

The annual statement of the road for the fiscal year ended June 30, 1889, shows total gross earnings of $8,586,565, as compared with $9,561,905 the previous year. Operating expenses were $5,156,065 in 1888-1889, and $4,751,475 in 1889. The rate of freight and passenger earnings for 1889 were 1.49 cents per ton per mile and 2.57 cents per passenger per mile, as against 1.30 per ton per mile and 2.46 per passenger per mile for 1888. The total equipment has been increased to 8,253 cars; 153 miles of road was completed and put in operation during the year, and the mileage now operated is 3,040. Bonds to the amount of $1,551,000 have been issued since the last report.

San Francisco & North Pacific.—It is expected to open the extension of the Sebastopol branch from Santa Rosa, northwest to Sebastopol, Cal., six miles, next month.

Savannah, Americus & Montgomery.—It is stated that this company is negotiating with the Columbus Southern for the consolidation of the two roads. The latter line is now building from Columbus south to Albany, Ga., 87 miles, and connects with the Savannah, Americus & Montgomery near Richland.

Seattle, Lake Shore & Eastern.—The grading and track laying on 10 miles of this road north of Pilgrim's Bluff, Washington, is being pushed to completion by Earl & McLeod, and it is expected to have the work finished by Jan. 1. By April 1 the grading will be completed to Stillaguamish, and at that time Smith & Burns, the contractors working south from the boundary line, will have 15 miles of road ready for the rails.

Seneca & Nemaha Valley.—This company has filed a charter in Kansas to build a standard-gauge road from Topeka northwest to the northern boundary of the state, passing through the counties of Shawnee, Jackson, Pottawatomie and Nemaha. The estimated length of the road is 85 miles. The capital stock is $1,000,000. J. E. Taylor and others, of Seneca, are directors.

South Carolina.—Another suit for foreclosure has been filed in the United States Court against the road. The complainants in this suit are holders of the original first-mortgage bonds of the old road, whose securities were not converted in the reorganization. There are now three suits for foreclosure pending in the courts against the road, the first being the suit of the first-mortgage consolidated bonds, under which ex-Governor Chamberlain was appointed receiver; the second in behalf of the (new) second-mortgage bondholders, and the third in behalf of the (old) first-mortgage bondholders. The case will come up for hearing in December.

Southwest Pennsylvania.—A special meeting of the stockholders of the company was held in Philadelphia last week at which they authorized an increase of the capital stock from $1,000,000 to $3,000,000. The new stock will not be issued at once, but as needed for improvements and extensions. The road is leased to the Pennsylvania, and extends from Greensburgh to Fairchance, Pa., 44¼ miles, and it has 45 miles of branches. Its funded debt is $900,000, and its cost was over $1,944,000.

Tacoma & Puyallup.—This company, recently chartered in Washington, has completed the location for its proposed road from Tacoma east to Puyallup. It is stated that construction will commence immediately at Puyallup. Some grading has already been done on the road.

Union Pacific.—The earnings and expenses for September, 1889, as compared with September, 1888, were as follows; the earnings of the entire system being given in the first table, and those of the Oregon Short Line & Utah Northern only in the second table:

Month of Sept.:	1889.	1888.	Inc. or dec.	
Gross earnings	$3,818,524	$3,611,616	I.	$206,908
Operating expenses	2,201,361	2,199,443	I.	1,918
Net earnings	$1,617,163	$1,412,173	I.	$204,990
Jan. 1 to Sept. 30.				
Gross earnings	28,168,724	28,215,251	D.	46,527
Operating expenses	17,602,262	17,899,240	D.	296,978
Net for nine months	$10,566,462	$10,316,011	I.	$250,451
OREGON SHORT LINE & UTAH NORTHERN.				
Month of September:				
Gross earnings	$510,422	$512,386	I.	$98,036
Operating expenses	317,237	611,774	I.	5,463
Net earnings	$293,185	$200,612	I.	$92,573
Net for nine months	2,109,318	1,661,600	I.	447,718

Vaudreuil & Prescott.—Tracklaying on this road is reported completed on the first 20 miles from Vaudreuil, Quebec, toward Ottawa, and grading is finished 10 miles further. The distance between Ottawa and Montreal by this line is 106 miles, being shorter by 10 miles than the Canada Atlantic and 14 miles shorter than the Canadian Pacific.

Wabash.—The special master has concluded taking testimony in the long-pending case in which the Indianapolis, Peru & Chicago seeks to obtain from the Wabash back rental, and makes two findings. One is that if the settlement is based on the net earnings, the Wabash shall pay to the road, or its assign, the Lake Erie & Western, $261,900, or if it is decided by the court that the sum shall be paid as rental, the lessees shall pay $221,000.

Western New York & Pennsylvania.—The preliminary surveys for the new line of this company to Oil City, Pa., have been completed between Franklin and Jackson Centre, and the locating survey was commenced this week, and is now in progress. The company has not yet definitely decided to build the line.

West Florida & Alabama.—It is claimed that work will be commenced at once on this road, which is projected to extend from St. Andrews Bay, Fla., to the Alabama state line. The office of the company is at St. Andrews, Fla. J. McReynolds is General Superintendent.

Wheeling & Lake Erie.—The annual report for the year ending June 30 last shows gross earnings of $4,680 a mile. The receipts were $870,494, the operating expenses $545,094, leaving net profits after payment of taxes of $302,157. Of this, $150,065 was used to pay interest on bonds, $144,866 paid the dividend of four per cent. on preferred stock, and $7,225 was added to the profit and loss, making a total surplus of $90,446.63.

Work upon the extension to the Ohio River opposite Wheeling has been prosecuted continuously, and the line has been opened throughout the coal territory. The directors have had surveys made to Steubenville and Bellaire, O., and they also intend to make provision for the purchase of a large additional equipment which has become necessary, and at the same time to arrange for the retirement at maturity of the Toledo Belt Co. bonds, $500,000, guaranteed by the Wheeling & Lake Erie, which mature in partial payments yearly. To provide funds for these purposes, the directors ask the stockholders to vote to issue a five per cent. extension and improvement mortgage bond for $1,900,000, of which $500,000 in bonds will be reserved in the hands of the trustee to retire the first-mortgage bonds of the Toledo Belt road, which will be retained by the trustee as additional security for the extension mortgage. The $1,400,000 bonds remaining, with such additional common stock as may be authorized, will suffice for the construction of the lines to Steubenville and Bellaire, and will provide the requisite additional equipment.

Wilson Terminal.—This company, referred to in our issue of Oct. 4, has filed its articles of incorporation in New York. The road is to extend from Wilson Station, on the Rome, Watertown & Ogdensburg, to Wilson Harbor, on Lake Ontario, a distance of 2½ miles. The capital stock is $25,000.

TRAFFIC.

Traffic Notes.

The passenger department of the Pennsylvania system west of Pittsburgh has issued a circular containing the names of 326 persons who have made improper use of mileage tickets. The purpose of the circular seems to be to enable agents to be on their guard when receiving applications from these people in future.

Dispatches from St. Joseph, Mo., state that the Atchison, Topeka & Santa Fe refuses to deliver live stock at St. Joseph to the Chicago, St. Paul & Kansas City, even going so far as to say it will no longer treat St. Joseph as a Missouri River common point. The agent of the last-named road secured one lot of 18 cars the other day by suing out a warrant of replevin. The cattle had been ordered sent by his road, but the way bill had been erroneously made out.

Passenger rates between Detroit and Chicago, which have been unsettled for several weeks, have been restored. Chairmen Blanchard, Midgley and Faithorn, composing the board of arbitration in the matter, have made their ruling as follows: The rates by the Michigan Central shall be $7.75, first class; $6, second class; $13.95, round trip. Chicago & Grand Trunk, $7.15, first class; $5.75, second class; $12.85, round trip. The Wabash rates will be the same as the Chicago & Grand Trunk, and the rates will go into effect on the 28th inst. The arbitration also calls for the withdrawal of all agencies and offices in Detroit except the depot ticket office of the Detroit, Grand Haven & Milwaukee, and the ticket office of the Chicago & Grand Trunk. All the lines are restricted to one office at the depot and one uptown office.

Difficulty of Dividing Traffic.

Last September the Chicago, Burlington & Quincy submitted a complaint to Chairman Walker, of the Interstate Commerce Railway Association, that it had not received its due proportion of the traffic from Southwestern Missouri River points, and called upon the Association to carry into effect Art. 17 of the agreement by at once taking measures to secure to the Burlington lines their just proportion of this traffic. Chairman Walker has just made his report upon the matter, which is as follows:

A hearing was had Oct. 3, 1889. The state of affairs referred to in the application as existing in August and during the first half of September, 1889, has since that time materially changed, and the temporary disadvantage to which the Burlington lines were then subjected does not now exist to an extent that appears to warrant any attempt at interference by the Executive Board. But if the situation were otherwise, it is not apparent in what way practical measures could be taken at the present time for the correction of an inequitable distribution of the traffic in question.

The presentation of the subject was quite thorough, and developed certain points upon which it seems proper to suggest that action should be initiated by the managers or the presidents, rather than by the Executive Board. As the agreement now stands, action by the Executive Board is to be taken when an application in writing is received from some line for a readjustment. Until such an application is made the board has no duty to perform. There are matters concerning which it would be proper that measures should be taken for their determination in advance of any controversy under Art. 17 of the agreement, instead of leaving them as open questions to be made the subject of contention when difficulties arise.

The subjects referred to are the following:

First—The exact description of traffic to be considered at competing points for the purposes in view should be ascertained by agreement or by arbitration. This is a necessary preliminary to the collation of the statistics upon which an application can be based. It was developed upon the hearing that the system of statistics now in use requires considerable modification in order to adapt it to existing conditions. Some changes have been made and are being put into effect, but uncertainties still remain which will be likely to give rise to difficulty in case of a further request being made.

Second—The ascertainment of the due shares of the several competing lines is probably within the power committed to the board in passing upon applications under this article, but it would be useful if they should be determined in advance by agreement or by arbitration. This would involve the establishment of a proper basis of distribution.

Third—Efficient machinery for effecting the result proposed by Art. 17 must be provided. Such machinery does not now exist, and is apparently beyond the power of the Executive Board to create. The means available at the present time for the purpose consist in recommendation for arbitrary differentials in tariffs, for restrictions upon traffic carryings, and for through consignments by connecting association lines. None of these is thought to be adequate for the purpose proposed.

Fourth—The course to be pursued in cases where lines not members of the association are competitors for the traffic in question must be determined. No other way for handling this subject appears to exist than through agreements or understandings which may be arrived at between the association and such outside lines.

Fifth—The difficulties attending the transit system now in use at various competing points should be adjusted.

The settlement of some of the foregoing points is believed to be a necessary preliminary to useful action by the Executive Board under Art. 17 of the agreement.

Local Freight Rates in Kansas.

A decision has been rendered by the Kansas Board of Railroad Commissioners in the case of alleged discrimination in freight rates brought by the city of Atchison against the Atchison, Topeka & Santa Fe, the Missouri Pacific and the Central Branch, Union Pacific. The wholesale merchants of Atchison represented that the rates from that city to Kansas points are excessive, and ask that the through rates from Kansas points to Chicago and Eastern points be made the sum of the two locals, east and west of Atchison. The Board says that the state has no authority to lay its hands upon any part of an inter-state rate, and the only remedy would be to advance the local or state rates. The companies are not necessarily guilty of unjust discrimination in accepting a less rate on through or inter-state business than on local or state business. The Central Branch, which is solely a local line, for the year ending June 30, 1889, lost $281,805. The Board is of the opinion, therefore, that the local rates are not unreasonable nor excessive.

Anthracite Coal Production.

The following is the statement of anthracite coal production for the month of October, 1889, compared with the same period last year, as compiled from returns furnished by the mine operators:

	Oct. 1889.	Oct. 1888.	Inc. or Dec.	
From Wyoming region	1,748,370	2,234,306	D.	485,936
From Lehigh region	663,725	673,590	D.	9,865
From Schuylkill region	1,299,775	1,279,630	I.	20,145
Total	3,711,870	4,187,526	D.	475,056
	Year 1889.	Year 1888.	Inc. or Dec.	
From Wyoming region	15,452,246	18,375,758	D.	2,923,511
From Lehigh region	5,233,268	4,518,168	I.	715,100
From Schuylkill region	8,613,647	8,829,217	D.	215,570
Total	29,299,161	31,723,143	D.	2,423,981

The stock of coal on hand at tide-water shipping points, Oct. 31, 1889, was 704,909 tons; on Sept. 30, 1889, it was 877,237 tons, a decrease of 172,328 tons.

East-bound Shipments.

The shipments of East-bound freight from Chicago by all lines for the week ending Saturday, Nov. 16, amounted to 64,282 tons, against 65,579 tons during the preceding week, a decrease of 1,297 tons, and against 56,586 tons during the corresponding week of 1888, an increase of 7,696 tons. The proportions carried by each road were:

	W'k to Nov. 16.		W'k to Nov. 9.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	3,296	6.7	4,233	6.5
Wabash	9,628	15.0	8,595	13.1
Lake Shore & Michigan South.	10,506	16.3	10,513	16.0
Pitts., Ft. Wayne & Chicago	9,953	15.5	9,413	14.3
Chicago, St. Louis & Pitts.	9,560	14.9	8,752	13.4
Baltimore & Ohio	5,635	8.8	7,283	11.1
Chicago & Grand Trunk	6,012	9.3	7,193	11.0
New York, Chic. & St. Louis	3,269	5.1	2,978	4.5
Chicago & Atlantic	5,423	8.4	6,619	10.1
Total	64,282	100.0	65,579	100.0

Of the above shipments 2,788 tons were flour, 24,725 tons grain, 3,028 tons millstuffs, 6,422 tons cured meats, 3,258 tons lard, 8,770 tons dressed beef, 1,019 tons butter, 2,325 tons hides, 319 tons wool and 6,472 tons lumber. The three Vanderbilt lines together carried 28.1 per cent., while the two Pennsylvania lines carried 30.4 per cent.